

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION
FOR IRELAND.

REPORT

ON THE

SEA AND INLAND FISHERIES OF IRELAND

FOR

1904.

IN TWO PARTS.

PART I.—GENERAL REPORT.

PART II.—SCIENTIFIC INVESTIGATIONS.

PART II.—SCIENTIFIC INVESTIGATIONS.

Presented to both Houses of Parliament by Command of His Majesty.

AGRICULTURE AND TECHNICAL INSTRUCTION
(IRELAND) ACT, 1899.
(62 AND 63 VIC., CAP. 50.)



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DEPARTMENT OF AGRICULTURE AND TECHNICAL
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FISHERIES BRANCH.

LIST OF PUBLICATIONS RELATING TO SCIENTIFIC INVESTIGATIONS.

Report on the Sea and Inland Fisheries of Ireland for 1901, Part II.,
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The following papers have been published separately, and
can be obtained on application to the Scientific Adviser,
Fisheries Branch, Department of Agriculture, &c., Dublin.

Ann. Rep. Fish., Ireland, 1901, Pt. II., [1903].

HOLT, E. W. L.—The Public Oyster Beds on the Coasts of Counties
Wicklow and Wexford, pp. 33. *App., II.*

HOLT, E. W. L., and BYRNE, L. W.—The British and Irish Gobies, pp.
30, pl. 2. *App., III.*

HOLT, E. W. L., and BYRNE, L. W.—On a Young Stage of the White
Sole, *Pleuronectes (Glyptocephalus) cynoglossus*, pp. 3, pl. 1.
App., IV.

HOLT, E. W. L., and BYRNE, L. W.—The British and Irish Species of
the Family Stromateidae, pp. 7, pl. 2. *App., V.*

WOLLERBAEK, ALF.—A Norwegian Method of Oyster Culture (Transla-
tion), pp. 27, pl. 10. *App., VI.*

FARRAN, G. P.—Record of the Copepoda taken on the Mackerel Fishing
Grounds off Cleggan, Co. Galway, in 1901, pp. 18, pl. 2. *App., VII.*

FARRAN, G. P.—The Nudibranchiate Molluscs of Ballynakill and Bofin
Harbours, Co. Galway, pp. 10, pl. 2. *App., VIII.*

COLE, GRENVILLE A. J., and CROOK, T.—On Rock Specimens dredged
from the Floor of the Atlantic off the West Coast of Ireland in
1901, pp. 9, pl. 3. *App., IX.*

GREEN, C.—Drawings and Descriptions of Apparatus used in Salmon
and Trout Culture, pp. 8, pl. 6. *App., XIV.*

Ann. Rep. Fish., Ireland, 1902-3, Pt. II., [1905].

DELAP, M. and C.—(i.) Notes on the Plankton of Valencia Harbour,
1899-1901; (ii.) Notes on the rearing in an Aquarium, of *Cyanea*
Lamarcki, Peron and Lesueur, pp. 20, pl. 2. *App., I.*

FARRAN, G. P.—Report on the Copepoda of the Atlantic Slope off
Counties Mayo and Galway, pp. 30, pl. 11. *App., II.*

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To

HIS EXCELLENCY JOHN CAMPBELL, EARL OF ABERDEEN, Lord Lieutenant-
General and General Governor of Ireland.

MAY IT PLEASE YOUR EXCELLENCY,

I am directed by the Vice-President to submit to Your
Excellency the Report on the Sea and Inland Fisheries of Ireland
for the year 1904, Part II., Scientific Investigations.

I have the honour to remain,

Your Excellency's faithful Servant,

T. P. GILL,

Secretary.

DEPARTMENT OF AGRICULTURE AND

TECHNICAL INSTRUCTION FOR IRELAND,

UPPER MERRION-STREET,

DUBLIN, 18th December, 1906.

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TO THE
SECRETARY OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

*Department of Agriculture and Technical
Instruction for Ireland,
Fisheries Branch.*

SIR,

I have the honour to submit the following Report, prepared by Mr. E. W. L. Holt, Scientific Adviser to the Fisheries Branch of the Department, and forming Part II. of the Report on Sea and Inland Fisheries of Ireland, 1904, already submitted.

I have the honour to be,

Sir,

Your obedient servant,

WM. SPOTSWOOD GREEN,
Chief Inspector of Fisheries.

7th December, 1906.

SEA AND INLAND FISHERIES, 1904.

REPORT OF THE SCIENTIFIC ADVISER,

TO THE CHIEF INSPECTOR OF FISHERIES.

SIR,

I have the honour to submit my Report of the scientific work of the Fisheries Branch of the Department for the year 1904.

The various papers which are reprinted below as an appendix have already been issued in separate form, as soon as completed, as parts of a series entitled "Scientific Investigations," and have been forwarded to libraries and scientific institutions and to individual workers in the fields of research to which they severally relate. While this course is rendered desirable by the attention now being devoted by the civilised nations of the world to the reasoned study of fishery problems, it also enables us to reduce the distribution of the whole Report, which is naturally a costly publication.

In my last Report I endeavoured to make it clear that the papers in the appendix, even if couched in unavoidably technical language, did actually contain information essential to the possibility of success in attack on practical fishery questions. The endeavour seems to have failed to some extent, but perhaps in course of time it may be more generally surmised that if a due understanding of the minutiae of habit and environment is of some use in agriculture so may it also be in the direction of piscatorial enterprise, and that because an animal has an unfamiliar name it does not necessarily follow that it is of no importance.

SEA FISHERIES.

Trawling.—While the regular survey of the principal East Coast grounds has been continued, the attention which it has been possible to pay to the important grounds on the South-East Coast leaves a good deal to be desired; but owing to the limited time which the exigencies of protection and other uses of the *Helga* leave at the disposal of scientific work it is unlikely that we shall be able to greatly extend observation in that direction.

Statements which from time to time reach us as to the scarcity of fish, notably plaice, in Dublin Bay and elsewhere on the East coast are borne out by our observations, but so far as we can see this condition is rather a reflection of a general scarcity in the Irish Sea than the result of any present local cause, such as over-fishing by some method not practised by complainants.

By the courtesy of owners of sailing trawlers in Galway Bay the staff of the Marine Laboratory at Ardfry have been able to make periodic cruises over the grounds worked by the Galway fleet.

The Department have been invited by the English Board of Agriculture and Fisheries to co-operate in a scheme of marking flat-fish in the Irish Sea. The *Helga* has accordingly commenced the marking of plaice by means of compressed vulcanite studs distinguished by initial letters and serial numbers. From the British side of the waters the work is carried out by the officials of the Western Sea Fisheries District Committee, and arrangements have been made for the mutual collection and exchange of labels, and payment of rewards.

The following rewards are offered :—

	s.	d.
1. For the label, the fish, and information of date and place of capture, and depth of water,	1	6
2. For the label alone, with the same information,	1	0
3. For the label alone, without information,	0	6

In addition to these rewards the market value of the fish will be paid, and the cost of postage will be refunded.

The system of rewards is being advertised at the principal trawling ports by posters in which a list is given of the persons at each place who have kindly undertaken to receive the fish for transmission to the Department. Similar operations have been commenced in Galway Bay, where the labels at present used are of brass. The English labels are of brass and bone connected by silver wire. The object of the experiments is, of course, the acquisition of exact information as to the migrations and rate of growth of the fish. Marking work in the North Sea has already yielded data which indicate the importance of the conclusions likely to be available if the work be carried on extensively for a number of years.

Thanks to the energy of Messrs. Beamish, Farran, and Kemp, the *Helga's* survey of the deep-water area off the West coast has been greatly extended, and the grounds between 100 to 400 fathoms have now been explored in preliminary fashion from Mayo to Kerry. Much of the bottom has proved quite unfit for trawling, and much that seemed of suitable consistency held, at the time of observation, no head of fish worth commercial attention. If there be good ground anywhere around the Porcupine Bank it has escaped survey, though, as we found in 1901, the place promises well enough for long-lining, and appeared, in our too brief experiment, to carry a fair stock of halibut and ling (see Report for 1901, Pt. II., App., No. I.).

The best deep-water ground located by the *Helga* lies about fifty miles off the Tearaght, with soundings of about 300 to 400 fathoms, and seems to be of considerable extent. Naturally the fishes are not those of shallow water, but most of them are reported to be good eating; and already, as the trawlers go

deeper and deeper to sea, the consumer is becoming familiar, at least in England, with fishes which recently were known only to students of ichthyology. At present on our South-western coast the trawlers have to pursue the hake even beyond the 100-fathom line, and the failure of this fishery in the course of a few years appears, in view of the history of previous hake-trawling, perhaps not so improbable as the great extent of the area and its frequent protection by weather might lead one to suppose. Administrative interference with the doings of vessels on grounds so remote is, I imagine, impracticable, nor, be it confessed, can we command the biological data necessary to indicate the lines upon which interference might be useful.

Mr. Byrne and I have in preparation a paper dealing with the results of the *Helga's* deep-water trawling, but so much of the material is new or little known that it cannot be dealt with in the present report.

International Researches.—I mentioned in my last report that, in the hope of being able to derive from the operations under the international scheme, some results of importance to our own fisheries, we had, as far as possible, carried out in our waters observations similar in nature and in time to those of the nations officially adhering to the scheme. Our results were, as a matter of interest as well as of courtesy, conveyed to the representatives of the International Bureau who in turn communicated the data collected by the vessels at their disposal. The Department has since indicated the formal adhesion of Ireland to the scheme, and deputed me to be their representative at the International meeting at Copenhagen in July, 1905. I have pleasure in reporting that the Council most cordially acknowledged, by special resolution, the assistance which the Department has afforded them by the communication of their results.

Irish Lights.—The arrangement which, by the kind permission of H. M. Commissioners of Irish Lights, we were able to make with the staff of the Skulmartin, South Arklow and Coningbeg lightships and of the Fastnet lighthouse, has been continued. In this way we receive daily information of the surface temperature of the water at the lights, and fortnightly samples of the surface water and surface organisms. In connection with the hydrographical section of the International scheme the temperature readings are at once communicated to the Marine Biological Association of the United Kingdom at Plymouth, and the samples of surface organisms are forwarded to them on receipt. For the first year the same course was adopted in regard to the samples of surface water, but these are now dealt with by Mr. Wm. C. Ramsden, of the Chemical Laboratory of Trinity College. A report by Dr. L. H. Gough, of the Marine Biological Association, on the first year's gatherings will be found in Appendix, No. VI., p. [227]. The author confines himself to a simple enumeration of facts since it would be unsafe to attempt to deduce conclusions of permanent value from the results of a single year's work.

Drift-net Fisheries.—The benefit which we hope to derive from participation in the International scheme has reference to the shoaling fishes of the surface and mid-water rather than to the more sedentary forms which are the object of the trawling industry, and at present, at any rate, drift-netting has for Ireland an importance vastly greater than that of any other mode of sea-fishing, if we class with it seining and gill-netting for the same kinds of fish. On this account, as we are now in the most favourable position for the tabulation of every sort of data which may bear upon the subject, I have not sought to hurry the preparation of conclusions. There is, however, a new feature of the fishery that merits a brief notice, viz., the capture early in the season by steam-drifters of considerable quantities of rather small mackerel, before the period at which the fish became accessible by the time-honoured methods of spring fishing. The catches appear to have been chiefly made between the South-east of Ireland and the opposite parts of Great Britain, and such samples as I was able to procure appear comparable in size to the so-called "cock mackerel" which usually appear in the nets of small boats on our western sea-board a little before the larger vessels meet with the true spring fish further at sea. In open winters such small fish may in effect continue the harvest fishery in bays and shoal water right through the winter, and it will remain to be seen whether their accessibility to the steam drifters during the past spring is attributable to or associable with the unusually mild character of the winter or is a newly discovered feature of constant recurrence. However the fishery may affect the interests of Irish industries it has so far been prosecuted in waters over which the Department has no control, and the catches, though in part transhipped to our markets, have not been directly landed in Ireland.

With regard to herring, it appears to me that there is on the part of steam-trawlers a slightly increasing tendency to devote catching power to this fish, as is now possible with otter trawls. That the trawlers have with such intent over trespassed on the domain of drift-boats I have never heard, and in view of the extraordinary fluctuation of the herring supply, even within the period of reasonably accurate statistics, there seems to be little reason to suppose that the species is in serious jeopardy from this latest manifestation of human interference.

Oyster Fisheries.—The experiments at Ardfry in Galway Bay, mentioned in my last report, are being continued. While the spatting of the first season, 1903, presented, in spite of what appeared to be rather adverse conditions, a fair measure of success, the yield of spat from the pond in 1904 was practically nil. The cause of this I shall not attempt to explain at present, but I note that while circumstances, which were certainly not influenced by any operations of ours, caused the appearance of an abundant crop of vegetable organisms in the spatting pond in the summer of 1903, there was no such yield in 1904. The pond was differently stocked with putative

parent oysters in the two years, and this may have had some influence on the produce. Naturally the physical as well as the biological conditions have been most carefully noted since the inception of the experiments, and after several seasons it should become possible to correlate cause and effect.

In the relaying work carried on in continuation of the operations at Muckinish I consider that we have obtained additional proof of the inutility of carrying over stock which fails to grow well in any one season. In effect an oyster once stunted in growth does not seem worth the trouble of cultivation; and, although an exceptionally favourable summer may cause a resumption of growth, it probably pays better as a general rule to sell such oysters for anything they will fetch as low grade ware than to hold them over through a close season.

In the cultivation of the spat collected in 1902 and 1903 we have met with difficulties which will have to be faced by everyone who may attempt in this way to enhance the natural productiveness of an oyster bed. This, and all other branches of our work, will form the subject of a detailed report, which will, I hope, be ready for presentation next year.

In addition to experiment in re-laying and artificial propagation, if it may so be called, we have commenced at Ardfry an attempt to restore or enhance the production of a natural bed. To the south of the neck of the Ardfry peninsula the narrows of Mweeloon Bay comprise an area whereon there appears to have always been a certain natural production of oysters, probably fished until recent years to the limit of its capacity. This place is rather widely separated from any of the other specially productive parts of the Ardfry fishery, and in my opinion may be reasonably regarded as probably self-supporting, though I cannot disregard the possibility of its deriving spat from the lower part of the bay.

The present lessee of the fishery has given the Department exclusive rights over this and some adjoining parts for a term of years, and we have increased the native stock by some 50,000 Falmouth and French oysters. With a view to improving the ground we have collected and scattered, just prior to the presumed spatting season, a large number of shells, and propose, with such annual provision of cultch and with such cleaning of the ground from weed débris as may appear necessary, to rely on natural causes for the recuperation of the bed.

The result, whatever it may be, should if carefully watched enable us to form some idea of the best means of attempting the improvement of several now almost extinguished public beds. Similar measures appear from official reports to have obtained a very considerable degree of success in France, but owing to the difference of climatic conditions it by no means follows that the same treatment will be equally effective, at least in point of time, on our coasts.

I considered, however, that the probabilities of the case justified me in recommending you to obtain the approval of the Department for a small expenditure in attempting to restock the public bed at Clsrenbridge. In my report for 1902-3,

Appendix, No. VIII., p. 216, Mr. Hillas and I offered some observations on the decline of this fishery, which were borne out by evidence given at the Public Inquiry held in February, 1905. As a result of the Inquiry you proposed to the Department certain by-laws which provide, *inter alia*, for the closing of parts of the bed for re-stocking purposes for periods of three years. The necessary legal formalities involved a delay which rendered it impossible for us to do anything in the way of re-stocking with large oysters this year, so it was determined to commence with the laying down of seed, which by reason of its small size would stand in no need of protection by closure of area. We procured some 135,000 seed oysters from Brittany, and, with the assistance of representatives of the dredging community, laid them down at an exceptionally low spring tide in April on those parts of the bed where it seemed they would have the best chance of thriving and of escaping the undue attention of hand-pickers. The oysters, being tile-reared, will bear throughout life the impress of the mortar to which the baby shell was attached, and it will thus be possible, with the good will of the dredgers, to have news of their future career. From experience with similar imported stock, some at least of them will spat this year, though none will be large enough for sale in December, and all that survive their natural perils until the summer of 1906 should be sufficiently large to aid in increasing the local supply.

Before making recommendations in regard to other public fisheries which we have been asked to take in hand, I intend to await at least the preliminary results of the work in Co. Galway.

SCIENTIFIC PAPERS.

The numbers of the appendix which relate to marine matters are all of a technical description, and must be taken as contributions to an essential knowledge of the environment of the objects of the fishing industry. Perusal will demonstrate, in the number of new species and new records of distribution, how exceedingly imperfect has hitherto been the information upon which we have to base opinions of the causes which govern the abundance and movements of fishes.

The Department is indebted to Dr. W. T. Calman, of the British Museum, for kindly working out our collections of *Cumacea* (Appendix, No. I., p. [3]), and to Professor Carpenter for similar help with the *Pycnogonida* (Appendix, No. IV., p. [171]). Mr. Tattersall deals in Appendix, No. II., p. [53], with the *Isopoda* of the Irish Seas, and in Appendix, No. V., p. [179], Mr. Tattersall and I have supplemented and brought up to date the account of the Irish *Schizopoda* given in the Report for 1902 and 1903.

Mr. Pearson (Appendix, No. III., p. [143]) makes the first contribution to these reports from the Ulster Fisheries and Biological Association. It is concerned with the littoral *Copepoda*, and while in the main a compilation of Irish records of this group, the list comprises some interesting discoveries made under the auspices of the Association at Larne Harbour.

The report by Dr. Gough on the collections of surface organisms and the report on the physical observations made at various Irish lights in 1904 (Appendix, No. VI., p. [227]) have been referred to earlier (see p. ix.).

INLAND FISHERIES.

Statistics of Salmon Fisheries (Appendix, No. VII., p. [304]).—The statistics of private fisheries which have been placed at my disposal for publication are indicative of a generally unsuccessful season in 1904, the peal being especially scarce, and in some instances deficient in size and quality as well as in number. It is possible that the toll levied upon the salmon supply by drift-nets at sea may have affected more or fewer of the northern river fisheries, both in regard to the yield of the season and, since the netting has been in operation on a fairly extensive scale for some years, in reduction of the general stock which reaches the breeding grounds. While, however, our knowledge of the movements of salmon at sea is still very far from warranting the expression of a positive opinion, I am inclined to think that the sea netting, which has only shown material increase within the last five years on the north-west coast, cannot yet have so far influenced the general stock as to be held in any way responsible for failure of southern fisheries, nor does it appear that the capture of salmon by nets not licensed *ad hoc* has sensibly increased or decreased on any part of the coast for many years: yet the southern rivers seem to have been at least as much affected by the shortage of peal as the northern.

Salmon Marking.—By the courtesy of owners of fisheries and anglers, marking operations have been continued on an increasing scale. At the suggestion of Mr. Hillas, Boards of Conservators have been asked and have consented to attach a short notice to the back of all licenses, and this has proved a most efficient means of bringing a knowledge of the marking work to the attention of those most concerned. In continuation of my paper published in the Report for 1901 I have asked Mr. Hillas to draw up a record of subsequent operations and results, which appears in the Appendix, No. VII., p. [315].

Artificial Propagation (Appendix, No. VII., p. [304]).—My report compares the output of fry of each hatchery for the seasons 1903-4 and 1904-5, the totals in regard to salmon being, respectively, 4,093,600 and 4,632,500, and some remarks are offered as to conditions affecting natural as well as artificial propagation during the two seasons.

As usual some of the hatcheries have experienced difficulty in obtaining a supply of spawners, but this was not general in either season.

The new hatchery at Killarney has been completed, and, though then unfinished, turned out a certain number of fry in the season of 1904-5.

An agreement has been made with several gentlemen interested in the angling of the Barrow for the establishment of a hatchery at Carlow.

Mr. Oliver has in hand the plans for a hatchery at Aasleagh on the Erriff river, and operations on a small scale at Listowel on the Feale are in contemplation.

A large number of fish annually ascend the Funshion, a large tributary of the Blackwater, but only a few slats and a very inadequate contribution of fry are reported to descend. To remedy this waste it is proposed to establish a hatching station at Rockmills, where the passage of the fish is delayed by a weir, and to use the fry partly for distribution in the Blackwater basin and partly for stocking rivers in which ordinary hatching operations are impracticable.

Spawning of Rainbow Trout (Appendix, No. VII., p. [310]).—It is, I think, now generally accepted that the turning loose of rainbow trout in our rivers and lakes is an unprofitable business. These fish are, however, of undoubted value for cultivation in enclosed water, whether merely as stock for the market or as affording a not too difficult prey to the angler. *Salmo irideus*, as is well known, spawns in America at a season much later than that affected by the *Salmonidae* of Europe (except, apparently, the trout of some Italian lakes), and a good deal of discussion has arisen about the reproductive season of "rainbows" which have been bred for generations on this side of the Atlantic. Herr Arens, who has kindly permitted us to print a translation of his paper, presents, so far as I am aware, the first serious attempt to give evidence upon the subject, and concludes that the data at his command afford no indication of the original breeding period having been affected by acclimatisation.

Reports of Clerks of Conservators (Appendix, No. VII., p. [358]).—Abstracts of these reports for 1903 and 1904 are given in parallel columns in continuation of the practice commenced in my report for 1902-3.

International Fishery Congress, Vienna, 1905.—Since the agenda of the Congress indicated that discussion would turn chiefly upon matters relating to fish-culture, it was decided that the Department should be represented by one of the members of their scientific staff. Mr. C. Green was accordingly delegated, and was, in company with other foreign members, elected a Vice-President.

An International Committee was formed for consultation in regard to sea fishery statistics, of which committee you have since become a member; and I understand that Herr Hofrat Krisch, of Trieste, who has made a special study of European fishery statistics, expressed high approval of the Irish system of statistics and of the statistical information prepared in this office for the purposes of the Congress.

A large number of papers were placed upon the agenda, and will in due course be published, together with the proceedings of the Congress.

Great interest was displayed in the account given by Mr. C. Green of the Department's salmon-marking experiments, and further information on this and other subjects relating to the scientific work of the Department has since been sent to applicants.

Subsequent to the actual sittings of the Congress visits were paid to three of the leading fish-cultural establishments in the neighbourhood of Vienna, where trout-farming is practised on a large scale. The feature most worthy of remark in the system is the extent to which natural food is cultivated in the ponds, artificial means being resorted to for increasing the nitrogen in the soil. The limestone formation and high mean summer temperature of the locality are probably factors necessary to success in these operations. It would appear that rainbow trout are no longer regarded in central Europe with the enthusiasm which marked their introduction, but under special conditions they still repay cultivation. The paper by Herr Arens, mentioned above, was read at the Congress.

The foreign representatives attending the Congress had the honour of being presented to H. I. M. the Emperor of Austria-Hungary, and were most hospitably entertained by the Corporation of Vienna and various private societies. The Department have since conveyed to Herr Hofrat Dr. Steindachner, the President, and to the Committee of the Congress their appreciation of the courtesy extended to the Irish delegate.

The next meeting of the Congress is to take place in the United States in 1908.

In conclusion I desire to acknowledge the assistance which I have received in the work of scientific investigation from my colleagues, the assistant naturalists, and from the technical assistant of the Fisheries Branch. To Mr. C. Green I am especially indebted for help in the preparation of this report and for the compilation of the index.

I have the honour to be, Sir,

Your obedient servant,

E. W. L. HOLT,
Scientific Adviser.

1st June, 1905.

APPENDIX TO REPORT

ON THE

SEA AND INLAND FISHERIES OF IRELAND FOR THE YEAR 1904.

PART II.—SCIENTIFIC INVESTIGATIONS.

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II.	The Marine Fauna of the Coast of Ireland, Part V. Isopoda, by W. M. Tattersall, B.Sc., Plates I to XI,	[53]
III.	A list of the Marine Copopoda of Ireland, Part I, Littoral Forms and Fish Parasites, by Joseph Pearson, B. Sc.	[143]
IV.	The Marine Fauna of the Coast of Ireland, Part VI. Pycnogonida, by Prof. George H. Carpenter, B.Sc., M.R.I.A., Plates I to III,	[171]
V.	Schizopodous Crustacea from the North-East Atlantic Slope. Supplement, by K. W. L. Holt and W. M. Tattersall, B.Sc., Plates I to V,	[179]
VI. i.	Plankton collected at Irish Light Stations in 1904, by Lewis Henry Gough, Ph.D.,	[227]
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THE MARINE FAUNA OF THE WEST COAST
OF IRELAND.

PART IV.

CUMACEA.

BY

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PLATES I. TO V.

I. INTRODUCTION.

This paper deals with the Crustacea belonging to the order commonly known as Cumacea, collected in the course of the fishery investigations carried on by Mr. E. W. L. Holt and his assistants under the Department of Agriculture and Technical Instruction for Ireland, during the years 1899-1904. Most of the gatherings are from the West coast, but a few from the East coast are also included (see Table I. below).

The collection is of great extent, about 170 separate gatherings being represented.* A few of these contained only young or mutilated specimens, and are therefore omitted from the lists given below. In all, forty-eight species have been identified, nine being regarded as new. Three of these form the types of new genera, one of which (*Ceratocuma*) is so aberrant that it has been considered necessary to establish a new family for its reception, while another (*Cumellopsis*) is in some respects intermediate between the existing families *Nannastacidae* and *Campylaspidae* and suggests that they ought probably to be merged into one. The new genus *Platycuma* presents in its spirally-coiled alimentary canal an anatomical character which is unique among the Malacostraca. The collection has also afforded material for many new observations on the characters and affinities of existing genera and species. One of the more interesting results is the identification of Norman's *Leucon brevirostris* with the later *Vaunthompsonia caeca* of Bonnier and its reference to the genus *Bathycuma* of Hansen.

The extent of this collection and the number of new and rare species which it includes offer a striking testimony to the

* See Postscript, p. 48.

efficiency of the methods of collecting devised and employed by Mr. Holt. Most of the gatherings, including all those from deep water, were obtained by means of tow-nets attached to the back of the trawl in such a position as to capture the organisms disturbed by the ground-rope. Two of the hauls obtained in this way by the "Helga" at stations CXX. and CXXI. (see Table IV. below) were especially rich, the former yielding eighteen and the latter nineteen species. It may be recalled that the entire collection of Cumacea obtained during the voyage of the "Challenger," amounted only to fifteen species. Curiously enough, most of the new species (seven out of nine) were obtained at station CXX., and I am told by Mr. Holt that this gathering has been productive of many novelties among the Mysidacea also. Nearly all the specimens came into my hands in a good state of preservation, but a few, which had remained for some years in formalin, had suffered considerably from the decalcifying action of the preservative, the integument having become quite soft and membranous and the sculpturing of the surface very difficult to see. The use of formalin should be avoided for crustacea, more especially for those in which the exoskeleton contains much lime.

A set of the species mentioned in this report, including types of all the new species, has been presented to the British Museum (Natural History) by the Department.

ii. LISTS OF STATIONS, WITH SPECIES OBTAINED AT EACH.

As regards the arrangement of the following Tables,* it is to be noted that Table IV. includes all stations outside of the fifty fathom line, whether the nets were used at the surface, in mid-water, or on the bottom.

* For the compilation of these tables I have to thank Mr. Stanley W. Kemp, who has taken a great deal of trouble in combining my rough notes with data obtained from the log-books of the various cruises into the form here given.

TABLE I.

EAST AND SOUTH-EAST COAST RECORDS.

Date.	Hour.	Station Number.	Depth in Fathoms.	Depth at which bottom was used.	Locality.	<i>Bodoeria scopulorum</i> .	<i>Iphinoë triapnosa</i> .	<i>Iphinoë setacea</i> .	<i>Eudorella truncatula</i> .	<i>Eudorella emarginata</i> .	<i>Eudorella deformis</i> .	<i>Cumella pygmaea</i> .	<i>Pseudocuma longicornis</i> .	<i>Lampropro fasciata</i> .	<i>Hemikamptoe rosea</i> .	<i>Diastylis rugosa</i> .	<i>Diastylodes biplicata</i> .
18/1/02	1.0-3.15 p.m., ..	XXXIIIc.*	21-25	21-26	Off Dungarvan Bay, co. Waterford, ..	..	..	..	..	..	..	..	..	..	..	..	..
4/5/02	11.15-11.30 a.m., ..	XLVa.*	40	40	9½ miles S. of South Arklow Lightship.	..	..	..	..	..	..	..	..	..	..	..	..
19/5/02	4.34-4.44 p.m., ..	LVIb.*	38-42	38-42	7 miles S.E. by E. of Blackwater Lightship, co. Wexford.	..	..	..	..	..	..	..	..	..	..	..	..
15/5/02	1.0-3.0 p.m., ..	S. 27	10-30	20-30	About 18 miles E. of Clogher Head, co. Louth.	..	..	..	..	..	..	..	..	..	..	..	..
22/5/02	11.30 a.m.-1.0 p.m.	S. 30.	27-30	27-30	2½ miles off Dunsany Point, co. Louth.	..	..	..	..	..	..	..	..	..	..	..	..
20/1/03	1.8-2.35 p.m.	S. 93b.	2½	2½	2½ miles off shore, Ballybrigan to Laytown, co. Dublin.	..	..	..	..	..	..	..	..	..	..	..	..
28/5/03	8.15-10.15 a.m., ..	S. 122	11-13	11-13	1 mile off shore, Ireland's Eye to Howth Head, co. Dublin.	..	..	..	..	..	..	..	..	..	..	..	..
4/6/03	9.5-9.45 a.m., ..	S. 151	5-5	3-5	Carnlough Bay, co. Antrim.	..	..	..	..	..	..	..	..	..	..	..	..
23/8/04	6.5-7.45 a.m., ..	R. 1	27-28	27-28	Off Dungarvan Bay, co. Waterford, ..	..	..	..	..	..	..	..	..	..	..	..	..

* *Relay Stations.*

TABLE II.
HARBOUR RECORDS, WEST COAST. 0-10 FATHOMS.

Date.	Hour.	Station Number.	Depth at which net was used.	Locality.	<i>Podotia scopeloides</i> .	<i>Podotia pulchella</i> .	<i>Iphise trispinosa</i> .	<i>Ventrifera cristata</i> .	<i>Podotia truncatula</i> .	<i>Camella pygmaea</i> .	<i>Nannastacus unguiculatus</i> .	<i>Nannastacus brevicaudatus</i> .	<i>Pseudocuma longicornis</i> .	<i>Pseudocuma similis</i> .	<i>Diastylis rufipes</i> .	<i>Diastylis rostrata</i> .
8/4/99	4-4.30 p.m.	Granville	Surface.	Achill Sound, co. Mayo.	..	..	..	..	..	..	..	..	..	..	..	..
4-5/8/99	9-30 p.m.	LXVIIa.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
5/8/99	10-30 p.m.	LXIX.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
7/8/99	10-30 p.m.	LXXIXb.	Surface.	Bofin, Inner and Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
8/8/99	10-30 p.m.	LXXIVa.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
10/8/99	10-0 p.m.	LXXNI.	Near Bottom.	Bofin, Harbour, Anchorage Pool.	..	..	..	..	..	..	..	..	..	..	..	..
11/8/99	11-0 p.m.	LXXNI.	Near Bottom.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
12/8/99	Midnight.	XCIIb.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
17/8/99	Midnight.	XCIV.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
18/8/99	9-0 p.m.	CXXII.	Near Bottom.	Bofin, Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
19/8/99	9-0 p.m.	CXLIV.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
31/8/99	10-0 p.m.	CXLVI.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
31/8/99	10-0 p.m.	CL.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
22/9/99	Midnight.	CLII.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
23/9/99	11-30 p.m.	CLIV.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
27/9/99	11-0 p.m.	CLV.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
30/9/99	12-0 p.m.	CLVIa.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
30/9/99	Midnight.	CLVIb.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
30/9/99	11-30 p.m.	CCXIII.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
15/9/99	11-0 p.m.	CCXXIVa.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
16/9/99	8-0 p.m.	CCXXIVb.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
18/9/99	8-0 p.m.	CCXXIVc.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
18/9/99	8-0 p.m.	CCXXV.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
19/9/99	8-0 p.m.	CCXXVa.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
19/9/99	8-0 p.m.	CCXXVb.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
19/9/99	Night.	CCXXVc.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
20/9/99	8-30 p.m.	CCXXVd.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..
20/9/99	8-30 p.m.	CCXXVe.	Surface.	Bofin, Outer Harbour.	..	..	..	..	..	..	..	..	..	..	..	..

TABLE II.—continued.

Date.	Hour.	Station Number.	Depth at which net was used.	Locality.	<i>Isodonta scorpioides</i> .	<i>Isodonta pulchella</i> .	<i>Ipchinot trispinosa</i> .	<i>Vanembempenia cristata</i> .	<i>Eudorella truncatula</i> .	<i>Camella pygmaea</i> .	<i>Nannastacus angusticollis</i> .	<i>Nannastacus brevicaudatus</i> .	<i>Pseudocuma longicornis</i> .	<i>Pseudocuma spinifila</i> .	<i>Diatyllis rugosa</i> .	<i>Diatyllis rostrata</i> .
26/9/02	11-15 p.m.	L 116.	Surface.	Ballynakill Harbour, Coasted Pt. to Ross Pt.	..	..	..	..	..	..	..	..	..	..	..	..
30/9/02	Abt. midnight.	L 119a.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
30/9/02	Abt. midnight.	L 119b.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
7/7/02	11.30 p.m.	L 123a.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
7/7/02	11.30 p.m.	L 123b.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
7/7/02	11.30 p.m.	L 123c.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
7/7/02	11.30 p.m.	L 123d.	Bottom.	Ballynakill Harbour, off Lamb's Island.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123e.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123f.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123g.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123h.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123i.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123j.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123k.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123l.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123m.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123n.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123o.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123p.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123q.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123r.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123s.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123t.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123u.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123v.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123w.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123x.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123y.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123z.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123aa.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ab.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ac.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ad.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ae.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123af.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ag.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ah.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ai.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123aj.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ak.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123al.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123am.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123an.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ao.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ap.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123aq.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ar.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123as.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123at.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123au.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123av.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123aw.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ax.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ay.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123az.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ba.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bb.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bc.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bd.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123be.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bf.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bg.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bh.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bi.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bj.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bk.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bl.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bm.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bn.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bo.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bp.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bq.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123br.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bs.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bt.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bu.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bv.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bw.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bx.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123by.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123bz.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ca.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cb.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cc.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cd.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ce.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cf.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cg.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ch.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ci.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cj.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123ck.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cl.	Bottom.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cm.	Surface.	Ballynakill Harbour, Fahy Bay.	..	..	..	..	..	..	..	..	..	..	..	..
22/7/02	11.30 p.m.	L 123cn.														

_____ stated the not used in a found.

United chemists stated the net was a "total loss" of water to Brim Harbour in

* The depth of water in Doun Fathog was 100 ft.

TABLE III.

WEST COAST RECORDS. UP TO 50 FATHOMS.

Date.	Hour.	Station Number.	Depth in fathoms.	Depth at which lowest was used.	Locality, Off the Coast of Co. Galway, unless otherwise stated.	<i>Boletia scopeloides</i> .	<i>Comella pygmaea</i> .	<i>Kannistaeus marginatus</i> .	<i>Pseudocuma longicornis</i> .	<i>Pseudocuma similis</i> .	<i>Dissyllis spinosa</i> .
22/7/00	Night.	CLXVIIIb.	40	0	Between Inishbeg and Cleggan Point, ..	..	..	..	..	..	..
9/5/00	Abt. 9.0 p.m.	Monica.	40	0	2½ miles W. of Inishturk, ..	..	..	..	..	..	..
22/5/00	Abt. 9.0 p.m.	Monica.	45	0	4½ miles W. by N. of Inishturk, ..	..	..	..	..	..	..
22/5/00	Abt. 9.0 p.m.	Monica.	45	0	4½ miles W. by N. of Inishturk, ..	..	..	..	..	..	..
22/5/00	Night.	Monica.	40	0	5 miles W. of Inishturk, ..	..	..	..	..	..	..
14/9/00	9.0 p.m.	Monica.	40	0	3½ miles N.W. by N. of Inishturk, ..	..	..	..	..	..	..
15/9/00	9.0 p.m.	Monica.	43	0	5½ miles W.N.W. of Inishturk, ..	..	..	..	..	..	..
22/7/01	Night.	Lilla.	28	0	5½ miles N.W. by N. of Inishturk, ..	..	..	..	..	..	..
6/8/01	9.0-9.30 p.m.	LXb.	30	20	5 miles N.W. of Inishturk, ..	..	..	..	..	..	..
6/8/01	9.0-9.10 p.m.	LXc.	30	20	5 miles N.W. of Inishturk, ..	..	..	..	..	..	..
11/10/01	6.0-6.30 p.m.	LXXXVla.	24	0	4½ miles N.E. by E. of Cleggan Head, ..	..	..	..	..	..	..
10/1/02	-	L- 50a.	25	0	Off mouth of Galway Harbour, ..	..	..	..	..	..	..
17/7/02	2.7-2.22 p.m.	A. XIX.	24	0	Between Clare L. and Achillbeg L. co. Mayo, ..	..	..	..	..	..	..
23/9/02	11.30-11.53 a.m.	S.R. 15	37	0	4½ miles off Puffin Island, co. Kerry, ..	..	..	..	..	..	..
1/5/03	12.0-12.10 p.m.	L- 293a.	20	0	2 miles N.W. by N. of Duvallan, ..	..	..	..	..	..	..
25/2/04	9.40-11.10 a.m.	W. 2	30	0	Binnkeelings Bay, co. Kerry, ..	..	..	..	..	..	..

TABLE IV.
WEST COAST RECORDS. 50-400 FATHOMS.

Date.	Hour.	Station Number.	Depth in fathoms.	Depth at which townet was used.	Locality.	Species.
8/5/00	abt. 8.0 p.m.	Monica.	70	35	84 miles N.N.W. of Slyne Head,	<i>Cyclops bicuspidatus</i> .
20/5/00	abt. 8.0 p.m.	Monica.	70	47	84 miles N.N.W. of Slyne Head,	<i>Cyclops bicuspidatus</i> .
20/5/00	-	Monica.	48	49	34 miles W.N.W. of High Island,	<i>Cyclops bicuspidatus</i> .
31/5/00	-	Monica.	50	0	About 18-14 miles W. by N. of	<i>Cyclops bicuspidatus</i> .
5/6/00	-	Monica.	60	15	Clare Island, co. Mayo.	<i>Cyclops bicuspidatus</i> .
30/4/01	abt. 9.30 p.m.	XXXc.	64	64	10 miles N.N.W. of Slyne Head,	<i>Cyclops bicuspidatus</i> .
27/5/01	-	XXXc.	60	60	44 miles N.W. of Shark Head, ..	<i>Cyclops bicuspidatus</i> .
8/5/01	-	XXXc.	60	60	34 miles W.S.W. of Shark Head,	<i>Cyclops bicuspidatus</i> .
8/5/01	-	XXXc.	60	60	34 miles W.S.W. of Shark Head,	<i>Cyclops bicuspidatus</i> .
27/5/01	10.10-10.30 p.m.	XXXVIIa.	59	0	4 miles W.S.W. of Shark Head,	<i>Cyclops bicuspidatus</i> .
27/5/01	10.10-10.30 p.m.	XXXVIII.	59	30	4 miles W.S.W. of Shark Head,	<i>Cyclops bicuspidatus</i> .
27/5/01	10.10-10.30 p.m.	XXXVIIIc.	59	59	4 miles W.S.W. of Shark Head,	<i>Cyclops bicuspidatus</i> .
20/6/01	8.50-9.25 p.m.	R.T. LXXIX.	175	175	90 miles W.S.W. of Cleggan Head.	<i>Cyclops bicuspidatus</i> .
19/7/01	9.30-10.0 p.m.	Lia.	55	0	34 miles W. of Shark Head, ..	<i>Cyclops bicuspidatus</i> .
24/8/01	abt. 9.0 a.m.	CXX.	362	362	27 miles W.N.W. of Achill Head,	<i>Cyclops bicuspidatus</i> .
24/8/01	1.20-3.40 p.m.	CXXI.	199	199	cn. Mayo.	<i>Cyclops bicuspidatus</i> .
24/4/02	9.0-9.30 p.m.	L. 76b.	42	46	64 miles N.W. of Cleggan Head,	<i>Cyclops bicuspidatus</i> .
12/5/02	9.0-10.0 p.m.	L. 87c.	53	53	4 miles N. by E. of Shark Head,	<i>Cyclops bicuspidatus</i> .
29/5/02	10.0-11.0 p.m.	L. 96a.	52	0	2 miles W. of High Island, ..	<i>Cyclops bicuspidatus</i> .
4/7/02	-	L. 171d.	50	50	14 miles W. of High Island, ..	<i>Cyclops bicuspidatus</i> .
13/8/02	1.0-1.45 p.m.	R.T.-A II.	116	116	50 miles W.N.W. of Cleggan Head,	<i>Cyclops bicuspidatus</i> .
14/2/03	8.55-9.15 a.m.	S.R. 5.	312	312	50 miles W.N.W. of Tearaght	<i>Cyclops bicuspidatus</i> .
13/7/03	abt. 9.0 a.m.	S.R. 31.	120	120	Loughros, co. Kerry.	<i>Cyclops bicuspidatus</i> .
7/8/03	-	S.R. 31.	306	306	50 miles W.N.W. of Cleggan Head,	<i>Cyclops bicuspidatus</i> .
17/8/03	12.40-1.0 p.m.	S.R. 44.	120	120	50 miles W.N.W. of Cleggan Head,	<i>Cyclops bicuspidatus</i> .
9/5/04	2.30-3.15 p.m.	S.R. 107.	120	120	50 miles W.N.W. of Cleggan Head,	<i>Cyclops bicuspidatus</i> .
						<i>Leptostylis macrura</i> .
						<i>Leptostylis boeckiana</i> .
						<i>Diastylis sp.</i> .
						<i>Diastylis bispinosa</i> .
						<i>Diastylis serrata</i> .
						<i>Diastylis tuberculata</i> .
						<i>Diastylis basipinna</i> .
						<i>Diastylis echinata</i> .
						<i>Diastylis foveolata</i> .
						<i>Diastylis cornuta</i> .
						<i>Platysia cephalata</i> .
						<i>Platysia typica</i> .
						<i>Hemilampyris cristata</i> .
						<i>Hemilampyris unilobata</i> .
						<i>Hemilampyris rosea</i> .
						<i>Ceratomyxa borealis</i> .
						<i>Pseudocuma boreocantha</i> .
						<i>Campylaspis rostrata</i> .
						<i>Campylaspis sulcata</i> .
						<i>Campylaspis verrucosa</i> .
						<i>Campylaspis nitens</i> .
						<i>Campylaspis glabra</i> .
						<i>Procamptaspis armata</i> .
						<i>Prasmanella</i> .
						<i>Cumellio</i> .
						<i>Nannastacus unguiculatus</i> .
						<i>Cumella gracilima</i> .
						<i>Cumella pyramis</i> .
						<i>Hydrotella bispinosa</i> .
						<i>Hydrotella truncatula</i> .
						<i>Leucon spinosum</i> .
						<i>Leucon pallidus</i> .
						<i>Parhymanus brevispinus</i> .
						<i>Vauitomyia cristata</i> .
						<i>Cyclops bicuspidatus</i> .

The following is a list of all the species obtained. The known distribution of each species is roughly indicated by the letters which stand after the name. More precise information, regarding the distribution of each species, is given in the third part of this paper.

A.—Species included in Professor G. O. Sars' "Crustacea of Norway." Vol. 3.

B.—Species already recorded from within the British Area, as defined by Norman (Ann. Mag. Nat. Hist., (6) V., p. 345, 1890).

C.—Species recorded off the Atlantic Coast of Europe to the South of the British Area.

D.—Species recorded from the Mediterranean.

E.—Species recorded from the Atlantic coast of N. America.

LIST OF SPECIES OF CUMACEA.

1. <i>Bodotria scorpioides</i> (Montagu), . . .	A. B. C. D
2. " <i>pulchella</i> (G. O. Sars), . . .	B. C. D.
3. <i>Cyclaspis longicaudata</i> , G. O. Sars, . . .	A. C. D
4. <i>Cyclaspoides Sarsi</i> , Bonnier, . . .	C.
5. <i>Iphinoë trispinosa</i> (Goodsir), . . .	A. B. C. D.
6. " <i>serrata</i> , Norman, . . .	B. D.
7. <i>Vauntomponia cristata</i> , Spence Bate, . . .	B. C. D.
8. <i>Bathycuma brevirostris</i> (Norman), . . .	A. B. D.
9. <i>Leucon pallidus</i> , G. O. Sars (?), . . .	A.
10. " <i>siphonatus</i> , n. sp., . . .	-----
11. <i>Eudorella truncatula</i> (Spence Bate), . . .	B. C. D
12. " <i>hispida</i> , G. O. Sars, . . .	E.
13. " <i>emarginata</i> (Krøyer), . . .	A. B. E.
14. <i>Eudorellopsis deformis</i> (Krøyer), . . .	A. B. E.
15. <i>Cumella pygmaea</i> , G. O. Sars, . . .	A. B. D.
16. " <i>gracillima</i> , n. sp., . . .	-----
17. <i>Nannastacus unguiculatus</i> (Spence Bate), . . .	B. D.
18. " <i>brevicaudatus</i> , n. sp., . . .	-----
19. <i>Cumellopsis Helgae</i> , n. g. and sp., . . .	-----
20. <i>Platycuma Holti</i> , n. g. and sp., . . .	-----
21. <i>Procampylaspis armata</i> , Bonnier, . . .	C. D.
22. <i>Campylaspis glabra</i> , G. O. Sars, . . .	A. B. D.
23. " <i>nitens</i> , Bonnier, . . .	C.
24. " <i>verrucosa</i> , G. O. Sars, . . .	A. D.
25. " <i>sulcata</i> , G. O. Sars, . . .	A. D.
26. " <i>rostrata</i> , n. sp., . . .	-----
27. <i>Pseudocuma longicornis</i> , Spence Bate, . . .	A. B. C. D.
28. " <i>similis</i> , G. O. Sars, . . .	A. B.
29. <i>Ceratocuma horrida</i> , n. g. and sp., . . .	-----
30. <i>Lamprops fasciata</i> , G. O. Sars, . . .	A. B.
31. <i>Hemilamprops rosea</i> (Norman), . . .	A. B.
32. " <i>uniplicata</i> , G. O. Sars, . . .	A.
33. " <i>cristata</i> , G. O. Sars, . . .	A. B.

LIST OF SPECIES OF CUMACEA—continued.

34.	<i>Platyaspis typica</i> , G. O. Sars,	.	.	A	D.
35.	„ <i>orbicularis</i> , n. sp.,	.	.	-----	—
36.	<i>Diastylis cornuta</i> , Boeck,	.	.	A. B.	
37.	„ <i>Josephinae</i> , G. O. Sars,	.	.	B. C.	
38.	„ <i>echinata</i> , Spence Bate,	.	.	A. B.	
39.	„ <i>insignis</i> , G. O. Sars,	.	.	B. C.	
40.	„ <i>rugosa</i> , G. O. Sars,	.	.	A. B. C. D.	
41.	„ <i>rostrata</i> (Goodsir),	.	.	A. B.	
42.	„ <i>spinosa</i> , Norman,	.	.	B.	
43.	„ <i>tubulicauda</i> n. sp.,	.	.	-----	—
44.	<i>Diastylodes serrata</i> , G. O. Sars,	.	.	A. B.	D.
45.	„ <i>biplicata</i> , G. O. Sars,	.	.	A. B.	
46.	<i>Diastylopsis</i> sp.,	.	.	-----	—
47.	<i>Leptostylis longimana</i> , G. O. Sars,	.	.	A.	E.
48.	„ <i>macrura</i> , G. O. Sars,	.	.	A.	D.

The Cumacea have been but little collected except in Northern seas. The results of the "Caudan" Expedition in the Bay of Biscay and of the "Puritan" near Naples, as well as the unexpected harvest of novelties which the present collection yields from a region which we have been accustomed to consider well explored, show that we are still very far from being in a position to discuss profitably the geographical distribution of the group even as regards the European seas. The list just given shows that of the 39 already known species which it includes, 26 extend to Norway (though some of our commonest species, such as *Bodotria scorpioides* and *Iphinoë trispinosa*, become very rare), and only 19 to the Mediterranean, while 13 are common to both. But of the Mediterranean species eight are deep-water forms, only recently found in the Mediterranean by the "Puritan" Expedition. When the Mediterranean is explored for Cumacea as thoroughly as the Norwegian seas have been by Prof. Sars, the numbers will, no doubt, come out very differently.

It is not to be supposed that the present collection, large as it is, by any means exhausts the Cumacean fauna of the west of Ireland. As regards the deep-water species, many occurred only in a single fortunate haul of the nets, while even among the shallow-water forms, it is likely that peculiarities of habit or of habitat have led to some being missed. Thus, for example, *Cumopsis Goodsiri* (van Beneden) is not represented, although it is probably distributed all round our coasts, and in many places is one of the very commonest species. Prof. Sars, however, has already remarked that this is a strictly littoral species, and confined to sandy bays. I have taken it in abundance by washing the sand between tide-marks at St. Andrews and elsewhere on the east coast of Scotland, and I suspect that the same method would reveal its presence in favourable localities in the west of Ireland also.

iii.—SYSTEMATIC NOTES AND DESCRIPTIONS OF NEW SPECIES AND GENERA.

Except where it is necessary to discuss the synonymy, I have given a reference only to the most important description of each species.

Under the heading "Distribution" I have included some unpublished records from the collection of the Rev. Canon A. M. Norman (these records are distinguished by the abbreviation "Mus. Nor."), and from collections of Cumacea sent to me for examination by the Paris Museum, and by the Naples Zoological Station. The length of the body is in every case measured in the middle line, including the telson (when distinct), but not the uropods.

FAMILY BODOTRIIDAE.

Bodotria scorpioides (Montagu).

Cancer scorpioides, Montagu, Trans. Linn. Soc., London, vii., p. 70, pl. vi., fig. 5. 1804.

Cuma scorpioides, Spence Bate, Ann. Mag. Nat. Hist. (2) xvii., p. 456, pl. xiv., fig. ii.; Norman, Rep. Brit. Ass., 1868 (1869), Reports, p. 273; Walker, Proc. Liverpool Biol. Soc. iv., p. 246, 1890; G. O. Sars, Crust. Norway, iii., p. 106, 1900 [non *C. scorpioides* G. O. Sars, *l.c.* p. 10, pls. i.-iii., 1899].

Cuma Audouinii, H. Milne-Edwards, Ann. Sci. nat., xiii., pp. 292-295, pl. xiii. B, figs. 1-7, 1828; H. Goodsir, Edinburgh New Philos. Jour. xxxiv., p. 125, pl. ii., figs. 14-16, pl. iv., fig. 12, 1843, reprinted in Bell, Brit. Stalk-eyed Crust., p. 328, and fig. on p. 326 (not fig. on p. 328), 1853.

Cuma Edwardsii, H. Goodsir, Edinburgh New Philos. Jour., xxxiv., p. 123, pl. ii., figs. 1-13 and 18, pl. iv., fig. 11, reprinted in Bell, Brit. Stalk-eyed Crust., p. 326, and fig. on p. 328 (not fig. on p. 326), 1853; G. O. Sars, Arch. Math. Naturvid. iii., p. 470, pls. i.-iii., 1878; id. Forh. Vidensk. Selsk. Christiania, 1882 (1883), p. 52; Hoek, Tijdschr. Nederland. Dierkundige Vereen. (2) ii., p. 170, pl. vii., fig. 1, 1889; G. O. Sars, Crust. Norway, iii., p. 12, pl. iii., 1899.

[Non *Cuma Edwardsii*, Krøyer, Naturhist. Tidsskr. iii., p. 504, pl. v., fig. 1-16, 1841; non *Cuma Edwardsii*, Spence Bate, Ann. Mag. Nat. Hist. (2) xvii., p. 457, pl. xiv., fig. iv., 1856].

As the nomenclature of the British species of *Bodotria* is involved in some confusion I have attempted to give the full synonymy of this species. All British writers, following Spence Bate, have applied Montagu's name to the species of which Goodsir was the first to give an adequate account under the name *Cuma Edwardsii*. Unfortunately Prof. G. O. Sars has

given Montagu's name to the closely allied species which Goodsir called *Bodotria arenosa*. On the Norwegian coast, according to Prof. Sars, the latter form is much the commoner of the two. In British waters, conversely, the former greatly predominates, being one of the commonest Cumacea all round our coasts. So far as I am aware, *B. arenosa* has only been recorded, in this country, from the Firth of Forth (Goodsir), the Clyde (Robertson Mus. Nor.), off Fair Isle (T. Scott), and off the north-east coast of England (Brady).

Montagu's figure and description would apply equally well to either of these two species, and if the name which he gave is to be retained it must be for that species which is known to occur on the south coast of England.

Occurrence.—This species occurred in twenty five gatherings, in shallow water, most commonly in those from Bofin harbour, though never in very large numbers.

Distribution.—Norway, north to Skudesnaes, north of Stavanger (Sars); British coasts, north to Shetland (Norman); Heligoland (Ehrenbaum); Holland (Hoek); France (H. Milne-Edwards, Bonnier); Mediterranean, Hyères (Walker), Syracuse, Naples, Spezia (Sars). In shallow water.

***Bodotria pulchella* (G. O. Sars).**

Cuma pulchella, G. O. Sars, Arch. Math. Naturvid. iii, p. 484, pl. vi., 1878; *op. cit.* iv., p. 124, pl. lx., 1879.

Occurrence.—A few specimens in four harbour gatherings.

Distribution.—Aberdeen, Clyde, Forth (T. Scott), Irish Sea (Walker), Sunderland (Mus. Nor.); Heligoland (Ehrenbaum); Bay of Biscay (Sars), N. and W. coasts of France (Mus. Paris); Cannes (Walker), Naples (Sars). In shallow water.

***Cyclaspis longicaudata* (G. O. Sars).**

Cyclaspis longicaudata, G. O. Sars, Forh. Vidensk. Selsk. Christiania, 1864 (1865), p. 207; Bonnier, Ann. Univ. Lyon xxvi., Campagne du "Caudan," p. 534, pl. xxviii., fig. 2, 1896; G. O. Sars, Crust. Norway, iii., p. 16, pls. vii. and viii., 1899.

Bonnier's figure of the carapace viewed from above (*i.e.*, pl. xxviii., fig. 2 b), shows the pseudorostrum much more truncate than in Sars' figure. I believe, however, that this is due to the carapace having been drawn as seen obliquely from the front. Our specimens agree very closely with Sars' account.

Occurrence.—In three gatherings from 199 to 382 fathoms.

Distribution.—Norway N. to Lofoten Is. (Sars); N. Atlantic (Norman); Bay of Biscay (Bonnier); Mediterranean (Lo Bianco). A deep-water species ranging from 120 metres (Lo Bianco) to 1,450 fath. (Norman).

Cyclaspoides Sarsi (Bonnier).

Cyclaspoides Sarsi, Bonnier, Ann. Univ. Lyon, xxvi., Campagne du "Caudan," p. 530, pl. xxviii., fig. 1, 1896.

This species has hitherto been known only by two immature specimens obtained by the "Caudan" at a depth of 950 metres in the Bay of Biscay. The most remarkable feature of the species is indicated by M. Bonnier in the words "La carapace . . . s'étend jusqu'au troisième segment thoracique et ne laisse libre que les deux derniers." His figures, however, show a very distinct suture line separating the carapace from the second leg-bearing somite. In the present specimen, a female with fully developed but empty brood-pouch, this suture is only faintly visible near the lower edge of the carapace. Dorsally, there is no trace of it, nor can any suture be discerned between the second somite and the third, of which only the pleural plates are distinct laterally.

This coalescence of the first three leg-bearing somites with the carapace is a feature not occurring elsewhere among the *Cumacea*, and must be regarded as the most important character distinguishing the genus *Cyclaspoides*, which, as I have elsewhere shown,* is at present restricted to this species.

In all the other characters which can be examined without dissection our specimen agrees very well with Bonnier's figures and description.

Occurrence.—One specimen from 382 fathoms.

Distribution.—Bay of Biscay, 950 metres (Bonnier).

Iphinoë trispinosa (Goodsir)

Iphinoë trispinosa, G. O. Sars, Crust. Norway, iii., p. 14, pls. v. and vi., 1899.

The specimens recorded under this name agree with Sars' description and figures quoted above, except in some small details, such as the fact that the abdomen in most cases is not longer than the cephalothoracic region. In all the British specimens which I have dissected the basis of the first pair of legs is distinctly longer than the remaining segments of the leg together. This appears to be the most tangible difference separating the northern form from that which Sars describes from the Mediterranean under the name *I. gracilis* (Arch. Math. Naturvid. iii., p. 496, pls. x.-xiv.), and which he later suggests keeping apart from *I. trispinosa* as a distinct species under the name *I. serrata*, Norman. The true *I. serrata*, however, is a quite distinct species (*v. infra*). I am still uncertain as to the separation of the British *I. trispinosa* from the Mediterranean *I. gracilis*, Sars (*not* the *I. gracilis* of Spence Bate), and if these are to be united it will be difficult to retain *I. tenella* distinct.

* Herdman's Rep. Ceylon Pearl Oyster Fisheries, Pt. ii., p. 161, Royal Society, 1904.

Occurrence.—This is one of the most abundant species in the collections, occurring in no less than 46 of the gatherings from shallow water, sometimes in considerable numbers.

Distribution.—Norway (very rare) (Sars), Kattegat (Meinert), British seas, very common, N. to Shetland (Norman); France (Bonnier). If *I. gracilis*, Sars, non Spence Bate, he identical the range of the species extends to the Mediterranean (Sars, Walker).

Iphinoë serrata, Norman.

Iphithoë [err. pro *Iphinoë*] *serrata*, Norman, Rep. Brit. Ass., 1866 (1867), Reports, p. 201; Norman, Rep. Brit. Ass., 1868 (1869), Reports, p. 272. Non *Iphinoë serrata* Sars, Arch. Math. Naturvid. iii., pls. x-xiv. (*I. gracilis* in text) 1878.

Canon Norman has pointed out to me that this species is not, as Sars supposed, identical with the form described by the latter from the Mediterranean under the name *Iphinoë gracilis*, Sp. Bate. Two of the characters given in Canon Norman's original description still suffice to distinguish the species from all the neighbouring forms viz., "Cephalothorax [carapace] . . . twice and a half as long as deep," and "First pereopods having both margins of basal joint denticulated." As regards the latter point, the denticulations on the inner edge of the basis are rather slight, but those on the outer edge are very strong. I hope to re-describe the type-specimens of this species elsewhere.

Occurrence.—A single female specimen with rudimentary oostegites, in 17-20 fathoms off Dunany Point, Co. Louth.

Distribution.—Sleat Sound, Skye, Shetland (Norman), Rothesay, S. W. Ireland, Naples (Mus. Nor.).

FAMILY VAUNTOMPSONIIDÆ.

GENUS *Vauntomponia*.*

Vauntomponia, Spence Bate, J. Royal Dublin Soc. ii., p. 102, 1858; *Vauntomponia*, Spence Bate, Nat. Hist. Review v., p. 203, 1858; G. O. Sars, Arch. Math. Naturvid. iv. p. 12, 1879; G. O. Sars, Rep. Cumacea Challenger, p. 22, 1886.

In 1879 Professor Sars gave as one of the characters of this genus "*Pedes 2 di paris . . . 5-articulati*," and figured that appendage of *V. cristata* as having only 5 segments apart from the

* I am inclined to think that the spelling of the name ought to stand as above, not, as is usual, *Vauntomponia*. The latter form is used in Spence Bate's paper in the Nat. Hist. Review, which appears to be a reprint of, and was probably later than, that in the J. Royal Dublin Soc., in which the aspirate is omitted. In any case the omission was clearly intended by the author, who states that in building up the word the Christian name and surname of Mr. Vaughan Thompson have been "both spelled according to sound."

coxa, which, according to his custom at that time, was omitted from the enumeration and from the figure. In 1886 he repeated the statement in a different form—"second pair . . . with the ischial joint not defined," and in his description of *V. meridionalis* (Rep. Cumacea Challenger, p. 24) stated that the second pair of legs were "composed of but six joints [*i.e.*, including the coxa], the ischial joint not being distinctly defined." It was somewhat surprising, therefore, to discover that in all the specimens of *V. cristata* which I could examine, the full number of segments was present in this appendage (Pl. I., fig. 1), there being a well-defined ischial segment which is not shown in Sars' figure. I am unable to find any grounds for thinking that the specimens which I have seen, including some from the Mediterranean, belong to a different species from that figured by Sars. It seems most likely that the individual dissected and figured by him was abnormal in this character. In *V. meridionalis* I find, on examining the type-specimen preserved in this Museum, that the ischial segment is quite distinctly visible without dissection, so that its absence must no longer be given as distinctive of the genus. The remaining species, *V. caeca*, Bonnier, will be discussed below under the genus *Bathycuma*.

Vauntompsonia cristata, Spence Bate.

Plate I., fig. 1.

Vauntompsonia cristata, G. O. Sars, Arch. Math. Naturvid iv. p. 13, pls. xxiii.-xxvi., 1879.

Occurrence.—This species appeared in considerable numbers in the gatherings from Ballynakill Harbour in June and July, 1902, and a few specimens in a single gathering from the same locality in May, 1903. All the specimens are adult males except one, a female with empty brood-pouch, labelled as having been obtained by the bottom tow-net. Sars has already noted that the males of this species sometimes appear in swarms at the surface, especially at night, while the females are only to be found in the mud at the bottom.

Distribution.—Shetland, Clyde, Forth (Robertson, Scott), S. of Ireland (Spence Bate); W. Coast of France (Mus. Paris); Mediterranean (Sars).

GENUS **Bathycuma**.

Bathycuma, Hansen, Isopoden, Cumaceen und Stomatopoden der Plankton Expedition, p. 55, 1895.

Dr. Hansen's genus *Bathycuma* is stated to differ from *Vauntompsonia* in the absence of an eye, in the form of the basis of the third maxilliped, which is slender and has the outer angle produced, and in the elongated shape of the body. The last of these characters is not very pronounced, and is, perhaps, not of

great systematic importance, but in the other two the species discussed below agrees with *Bathycuma*. Hansen further states, however, that his species agrees with *Vauntompsonia* in the structure of the second pair of legs, and he figures and describes these as consisting of six segments (i.e. including the coxa).

I have shown above that in *Vauntompsonia* the second legs normally have the full number of segments, and it is just possible that Hansen has been led into error by Sars' statement on this point. In either case the present species seems to resemble the type-species of *Bathycuma* more closely than it does that of *Vauntompsonia*, and I have accordingly placed it in the former genus. The chief differences between the known characters of the two species of *Bathycuma* may be summarized as follows:—

Carapace nearly twice as long as deep, upper margin of pseudorostrum sloping downwards, continuing the curve of the dorsal keel, the serrations of which run to its tip. Basis of third maxillipeds without teeth. Second pair of legs with ischium suppressed [?]. Peduncle of uropods longer by one-third than the equal rami, which are stout. First segment of endopod little longer than the second and nearly twice as broad. *B. elongata*.

Carapace one and two-thirds as long as deep, upper margin of pseudorostrum horizontal, without serrations. Basis of third maxillipeds with a row of strong teeth on its lower surface. Second pair of legs with ischium distinct. Peduncle of uropods sub-equal to the endopod and shorter than the exopod. The rami slender, first segment of endopod more than one and a half times as long as the second and very little broader. *B. brevirostris*.

***Bathycuma brevirostris* (Norman).**

Leucon brevirostris, Norman, Ann. Mag. Nat. Hist. (5) iii, p. 71, 1879.

Vaunthompsonia caeca, Bonnier, Ann. Univ. Lyon, xxvi., Campagne du "Caudan," p. 536, pl. xxviii., fig. 3, 1896.

Norman's description of the dorsal crest of his *Leucon brevirostris* as having "the teeth not regularly arranged as usual in single file, but in an irregular double alternating line," suggests at once a comparison with the genus *Vauntompsonia*, and an examination of specimens in the present collection led to the suspicion that Norman's species might be the same as that described by Bonnier as *V. caeca*. By the kindness of Canon Norman I have been able to examine carefully the type of his species, and the result has been to establish its identity, in all characters visible without dissection, with Bonnier's species. The largest specimen in this collection, an immature female, measures 5.6 mm. in length. Canon Norman gives 10 mm. as the length of his specimen, but this must have included the uropods, for I find that the body of the specimen, which is now broken in two, measures only about 8 mm. Bonnier gives 10 mm. as the length

of an immature male. The first legs were broken both in Norman's and in Bonnier's specimens. In a female in the present collection they are complete, and are about one and two-thirds the length of the carapace, much more slender than in *V. cristata*, with the carpus and dactylus subequal and the propodus half as long again. The basis is armed with strong spines as described by Bonnier.

In the female sex, owing to the shape of the basis of the third maxilliped, the species is hardly to be distinguished, without dissection, from the genus to which Norman referred it. In the male sex, however, the presence of a full series of pleopods suffices to place it among the *Vauntompsoniidae*.

Occurrence.—Five specimens from 382 fathoms.

Distribution.—S. of Rockall, 109 fathoms (Norman); Bay of Biscay, 350—1,710 metres (Bonnier); Mediterranean, 950—1,100 metres (Lo Bianco.)

FAMILY LEUCONIDAE.

Leucon pallidus, G. O. Sars (?)

Leucon pallidus, G. O. Sars, Forh. Vidensk. Selsk. Christiania 1864 (1865), p. 182; id., Kgl. Svenska Vet. Akad. Handl. xi. No. 6, p. 8, pl. iii, fig. 10, 1873; id., Crust. Norway, iii, p. 33, pl. xxv.

The specimens which I record under this name differ from Sars' account of the species in possessing on either side of the cephalic lobe, just above the end of the lateral fissure, a small, inconspicuous denticle, sometimes two. The terminal spine of the endopod of the uropods is distinct from the segment which carries it. All the specimens are immature, and more or less damaged.

Occurrence.—Four specimens from 382 fathoms.

Distribution.—Spitzbergen, 1,400 fathoms; Norway, 60-400 fathoms (Sars).

Leucon siphonatus, n. sp.

Plate I, figs. 2-4.

Young Female. Total length, 3.85 mm.

The carapace is somewhat compressed, a little less than one-third of the total length, and less than twice as long as deep. The dorsal edge is slightly arched and has a single tooth near the tip of the cephalic lobe. The pseudorostrum (Pl. I., fig. 3) is prominent, slightly upturned, the lateral plates meeting in front of the cephalic lobe for about one-fourth of the total length of the carapace. The dorsal edge of the pseudorostrum bears several teeth near the base, the tip is rounded, and obscurely serrated, and there are two stout spiniform teeth on the lower margin. From

the end of the pseudorostrum the branchial siphon projects for a distance equal to the length of the carapace. It is surrounded by a number of stiff setae, springing from the margin of the pseudorostrum. On the dorsal side these setae are only a little shorter than the siphon, but they diminish rapidly in length towards the ventral side. The antennal notch is rather narrow. Above it the antero-lateral margin bears three teeth. The antero-lateral angle is truncate, and bears inferiorly a sharp tooth, followed on the lower margin by several serrations, diminishing posteriorly. On the side of the carapace, near the antero-lateral margin, is a group of small denticles.

The abdomen is moderately stout, and little longer than the cephalothorax.

The antennules (Pl. I, fig. 3) have the last segment of the peduncle a little shorter and more slender than the preceding, and about equal in length to the outer flagellum. The latter has three segments, the proximal forming about half its length, while the terminal one is very small. The inner flagellum is unsegmented, and equal in length to the first segment of the outer one. The antenna has a long and slender process projecting from the antennal notch and tipped with sensory setae. The mandible (as seen through the carapace without dissection) has the characteristic Leuconid outline.

The first legs are more than one and a half times the length of the carapace and moderately stout. The dactylus is about one-third the length of the propodus, and the latter is equal in length to the carpus.

The uropods (Pl. I, fig. 4) are about equal in length to the last two somites together. The peduncle is slightly expanded distally, and bears a few setae on the inner margin. The rami are sub-equal, and longer by about one-fourth than the peduncle. The endopod has the proximal segment nearly three times as long as the distal, with five spines on its inner edge. The distal segment has two spines internally, and a long slender apical spine. The exopod has setae on outer and inner edges, and a group of five at the tip.

This new form differs from all the species of the genus except *L. tenuirostris*, Sars (Challenger Rep. Cumacea, p. 38, pl. V., figs. 1-4, 1886), in the relatively large size of the inner flagellum of the antennule, and in the serrated antero-lateral margin of the carapace and narrow antennal notch. From *L. tenuirostris* it is distinguished by the much shorter pseudorostrum. Further, it is distinguished from all the known species of the genus by the great development of the branchial siphon, and the long stiff setae which accompany it.

Occurrence.—A single specimen from 382 fathoms.

Distribution.—I have observed a number of specimens which apparently belong to this species in a collection of Cumacea from deep water near Capri, sent to me for examination by the Naples Zoological Station.

Endorella truncatula (Spence Bate).

Endorella truncatula, G. O. Sars, Crust. Norway, iii., p. 37, pl. xxix., 1900.

Occurrence.—In small numbers at eight stations, all in shallow water except one, "50 miles W.N.W. of Cleggan," where a solitary specimen occurred, at a depth of 120 fathoms, in company with such characteristic deep-water forms as *Procampylaspis armata*, *Diastylis cornutus*, &c. Only in one gathering, from Ballynakill Harbour (14-1-02, L, 13 B.), did the species occur in any numbers.

Distribution.—Norway, becoming rare in the north (Sars), to East Finmark (Norman), Kattegat (Meinert); Heligoland (Ehrenbaum); British Seas to Shetland (Norman), Valentia (Mus. Nor.); Naples, Spezia (Sars); "Porcupine" Exp., 55° 11' N., 11° 31' W., 1,443 fathoms. With the exception of the last, all the records refer to shallow water.

Endorella hispida, G. O. Sars.

Endorella hispida, G. O. Sars, Kgl. Sveuska Vet. Akad. Handl. ix., No. 13, p. 49, pl. xviii., fig. 95-97, 1871.

A young male 5 mm. long and two still smaller specimens are referred, though with some hesitation, to this species, chiefly because the antero-lateral tooth of the carapace is much produced and straight. The antepenultimate segment of the second leg is $1\frac{1}{2}$ times the length of the preceding segment in the male specimen. The species has only been recorded hitherto off the New England coast.

Occurrence.—At two stations, in 320 and 200 fathoms.

Distribution.—39° 54' N., 73° 15' W., 30-35 fath. (Sars).

Endorella emarginata (Krøyer).

Leucon emarginatus, Krøyer, Nat. Tidsskr. (n.s.) ii., p. 181, pl. i., fig. 7, pl. ii., figs. 3a-h, 1846.

Endorella emarginata, G. O. Sars, Crust. Norway iii., p. 36, pls. xxvii. and xxviii., 1900.

This well-defined species appears to be an Arctic and Boreal type, and its absence from the gatherings made on the west coast is noteworthy.

Occurrence.—Two young female specimens, from 30-32 fathoms, off Clogher Head.

Distribution.—Norway (common), N. to Vadsö (Sars); Hebrides (Norman), Clyde (Scott), off Northumberland (Brady); Heligoland (Ehrenbaum); Arctic Seas, from Greenland (Hansen), to the Yenisei (Stuxberg), Gulf of St. Lawrence, Halifax (Smith). Shallow water, to 410 fath.

Eudorellopsis deformis (Krøyer).

Eudorellopsis deformis, G. O. Sars, Crust. Norway, iii., p. 40, pls xxxi. and xxxii., 1900.

Like the last, this species is a typically northern form, and has not been found on the west coast.

Occurrence.—Two small specimens, Carnlough Bay, Co. Antrim, 3-5 fathoms.

Distribution.—Greenland (Krøyer, Hansen), Iceland, Norway (rare) (Sars), Kattegat (Meinert); Fair Isle, Aberdeen, Forth, Clyde (Scott), Northumberland (Brady); Heligoland (Ehrenbaum). N.E. America (Sars). Shallow water, to 30 fath.

FAMILY *NANNASTACIDAE*.

As originally defined by Sars, the families *Cumellidae* (= *Nannastacidae* of Spence Bate), including the genera *Cumella* and *Nannastacus*, and *Campylaspidae*, consisting of the single genus *Campylaspis*, were sharply distinguished from each other by the structure of the mouth-parts, which in the last-named genus are strikingly different from those of other *Cumacea*. Bonnier in 1896 described a new genus, *Procampylaspis*, which he referred to the *Campylaspidae*, but which, in some characters, notably in having the first maxilliped and the maxilla of normal structure, approaches the *Nannastacidae*. Sars (Crust. Norway iii., p. 83) seems inclined to refer Bonnier's genus to the latter family; and Stebbing (Willey's Zool. Results, Pt. v., p. 611) suggests that it may be found necessary to establish a separate family for *Procampylaspis*, because of the peculiarities of structure presented by the maxillipeds. The two new genera described below complicate the problem still further, by having mouth-parts of a type more "normal" and generalized than in any of the genera above named. They cannot be placed in either of the existing families without doing violence to the accepted definitions, and, if Mr. Stebbing's suggestion of a separate family for *Procampylaspis* were adopted, a fourth family would have to be established for them. For the present it seems better to admit that the old distinction between *Nannastacidae* and *Campylaspidae* has broken down, and to treat all these genera as forming a single group under Spence Bate's name *Nannastacidae*, sharply if not very profoundly separated from all other *Cumacea* by uniting the characters of an unjointed endopod of the uropods, no telson, no pleopods in the male, and having natatory exopods on two pairs of legs in the female, and four in the male.

A synopsis of the more important differential characters of the genera may be provisionally attempted, as follows:—

A.—Molar process of mandible styliform, pointed.

(a) Maxilla and first maxilliped of normal structure, second maxilliped straight, with greatly developed claws on terminal segment.

Procampylaspis.

- (b) Maxilla reduced to a simple plate without movable endites, first maxilliped also reduced, with only three distinct segments, the terminal one very minute. Second maxilliped with propodus inflated and obliquely articulated with preceding segment.
Campylaspis.

B. —Molar process of mandible stout and truncate.

- (a) Second maxilliped with distinct ischium, carapace more or less overhanging the anterior thoracic somites.

(a) Carapace much depressed and expanded laterally. *Platycuma*.

(β) Carapace sub-ovoid. *Cumellopsis*.

- (b) Second maxilliped without distinct ischium, carapace not overhanging the anterior thoracic somites.

(a) Eye single, or absent. *Cumella*.

(β) Eyes paired. *Nannastacus*.

Cumella pygmaea, G. O. Sars.

C. pygmaea, G. O. Sars, Arch. Math. Naturvid. iv., p. 94, pls. 1–lii; id., Crust. Norway iii., p. 81, pl. lv.

Occurrence.—This is one of the most common species in the collection, occurring in forty-four of the gatherings, sometimes in considerable numbers, at the surface and down to sixty-seven fathoms. In the great majority of cases only males are present, but one or two females occur in bottom gatherings.

Distribution.—Norway, north to Lofoten (Sars); Shetland (Norman), Moray Firth, Aberdeen, Clyde (Scott), Sunderland (Brady), Plymouth, Jersey, Valentia, Westport (Mus. Nor.); Heligoland (Ehrenbaum); Mediterranean (Sars, Walker). Shallow water.

Cumella gracillima, n. sp.

Plate I., figs. 5–14.

Female, sub-adult, with developing oostegites. Total length 2.75 mm.

Carapace (Pl. I., fig. 5) a little more than one-quarter of total length, moderately compressed, keeled on the dorsal surface and armed with about four long spiniform teeth. The vertical height is about three-quarters of its length. The pseudorostrum is bent upwards nearly at right angles with the long axis of the body. It is very obliquely truncate, and is produced distally into a spiniform process on the upper or posterior side. There is no eye, and the ocular lobe is represented by a narrow process which runs up between the lateral plates almost or quite to the tip of

the pseudorostrum. Owing to the position of the parts it is difficult to see whether this process is exposed on the surface or is covered in by the lateral plates. The two branchial siphons are separate from each other and are very long. Each is formed of a transparent structureless membrane rolled up into a spiral tube and capable of elongation and contraction by the telescoping of the coils one into the other. In the specimens examined, the siphons, though apparently not fully expanded, project from the opening of the pseudorostrum for a distance nearly equal to the length of the carapace. The antero-lateral margin is vertical and the antennal notch is hardly indicated. The antero-lateral corner is armed with a long curved compressed spine, followed by a series of about nine similar spines diminishing in length posteriorly and occupying the anterior third of the strongly convex lower margin. Although of considerable size these spines are very thin and transparent and easily overlooked.

The free thoracic somites diminish rapidly in height from before backwards. The pleural plates are small and project very little at the sides. The first two somites are very short antero-posteriorly and the fourth has on its dorsal surface a curved transparent spine, perhaps paired.

The abdomen is very slender. Its length is three-fifths of the total length of the body, and the fourth somite is three times, the fifth about five times as long as thick. The last somite is about two-fifths the length of the preceding.

The antennules (Pl. I., fig. 7) are very long and slender, nearly two-thirds of the length of the carapace. The proximal segment is longer than the other two together, slightly curved, and its thickness at the middle is only about one-seventh of its length. The second segment is nearly twice as long as the third, and has a very small process on its outer margin, not projecting beyond its distal end. The external flagellum is nearly as long as the second peduncular segment. It consists of three segments, the distal one very minute. The inner flagellum consists of two segments.

The antennae (Pl. I., fig. 8) unlike those of the species already known, are distinctly divided into three segments, each bearing a seta, that on the middle segment being very long.

The mandibles, lower lip, maxillulae, maxillae and first maxillipeds agree very closely with Sars' figures of these appendages in *Cumella pygmaea*. The branchial apparatus (apart from the siphons already mentioned) was not sufficiently well preserved to permit examination.

The second maxillipeds have the basis relatively a little longer than in *C. pygmaea*.

In the third maxillipeds (Pl. I., fig. 9) the basis is more slender than in *C. pygmaea* and its distal outer angle is not produced; the merus is less produced externally, and its articulation with the carpus is less oblique.

The first legs (Pl. I., fig. 10) have the basis slender and unarmed and less than two-thirds the length of the remaining segments. The carpus and propodus are subequal and more than twice the length of the dactylus.

The second legs (Pl. I., fig. 11) differ from those of *C. pygmaea* in their greater slenderness, and the somewhat longer terminal segment.

The remaining legs are much longer and more slender than those of *C. pygmaea* and have the carpus much longer, about three times the length of the propodus in each case. The basis is longer than the remaining segments in the third pair, equal to them in the fourth, and two-thirds of their length in the fifth (Pl. I., fig. 12).

The uropods (Pl. I., fig. 13) are elongated and very slender. The peduncle is three times the length of the last somite, its diameter less than one-seventeenth of its length. The rami are subequal and a little more than half of the length of the peduncle. The endopod has four spines on its inner edge and a long terminal spine. The exopod has a very long and slender terminal spine and a spinule close to its base. There are one or two small setae on the inner margin of the peduncle and on the rami.

The integument is everywhere very thin and flexible, transparent, and without any very definite texture.

Male. Total length 2.4 mm.

The carapace (Pl. I., fig. 6) is one-fourth of the total length, less compressed than in the female, with the dorsal edge smooth, without teeth. The rostrum is more oblique than in the female and less sharply pointed. The teeth of the lower margin are reduced to four, and are much smaller than in the female.

The branchial siphons were injured in both specimens but appear to be shorter than in the female. The abdominal somites are without a lateral groove. The antennal flagella do not extend beyond the last thoracic somite.

The uropods (Pl. I., fig. 14) are less elongated than in the female. The peduncle is about two and a half times the length of the last somite and less than twice the length of the rami. There are two spines on the distal part of the inner margin. The endopod has six spines along its inner edge, increasing a little in length distally, and a long terminal spine.

This species is distinguished from both the known species of *Cumella* by the much greater slenderness of the posterior part of the body and of the limbs, especially the uropods, by the sharply upturned pseudorostrum, and by the teeth on the lower margin of the carapace. Further, it renders necessary a modification of the generic diagnosis, since it possesses a three-segmented antenna in the female, and has the distal angle of the basis of the third maxillipeds not produced.

Occurrence.—2 males and 3 females, from 382 and 199 fathoms.

***Nannastacus unguiculatus*, Spence Bate.**

N. unguiculatus, G. O. Sars, Arch. Math. Naturvid. iv., p. 109, pls. lv.-lvii.

As Sars has observed, specimens of this species, especially females, are frequently so encrusted with mud that their examination is a matter of great difficulty. The females in the present

collection differ slightly from Sars' figures in having the pseudo-rostrum less produced, and, in some cases, the lateral corners less acute. In one or two I am unable to see any trace of the series of flattened spines usually conspicuous on the side of the carapace, but whether this is natural or is the result of rough handling (and perhaps the decalcifying action of the formalin used in preservation) I am unable to say. The males have the carapace less coarsely granulated than is shown by Sars, and there is some variation in the development of the serrated crests on the abdomen.

Occurrence.—This is one of the most abundant species, occurring in 49 gatherings from shallow water. In nearly all cases only males were got, often in considerable numbers, but one or two females were present in a few of the gatherings.

Distribution.—22 miles North of Shetland (Scott), Clyde (Robertson), Irish Sea (Walker), W. of Ireland (Mus. Nor.); W. coast of France (Mus. Paris); Mediterranean (Sars). Possibly extending to the Red Sea (*Diops parvulus*, Paulson).

Nannastacus brevicaudatus, n. sp.

Plate I., figs. 15-19.

Female, with oostegites. Total length, 1.8 mm.

In general form resembling *N. unguiculatus* but with shorter and stouter body. Carapace two-fifths of the total length. Pseudo-rostrum very short, not produced above the level of the eye when seen from the side. Antero-lateral corner less produced than in *N. unguiculatus*, rounded at the tip, finely serrated below. The surface of the carapace is everywhere rough, with prominent granules, but there are no series of flattened spines on the dorsal and lateral surfaces as in *N. unguiculatus*. The free thoracic somites have a few small spines near the lateral margins.

The abdomen is shorter and stouter than in *N. unguiculatus*, and is about three-fourths the length of the cephalothoracic region. The first three somites are broader than long. In the last somite the length and breadth are nearly equal, and there is no median spine on the hind margin.

The eyes, though well-developed, appear colourless in the specimens examined. Specimens of *N. unguiculatus* in the same gathering have the eye-pigment well preserved, so that its absence in *N. brevicaudatus* is probably a specific character.

The antennules are very similar to those of *N. unguiculatus*, but the second and third segments of the peduncle are a little shorter, the process on the second segment is smaller than in that species, and there is only one seta on the distal end of the same segment. The antennae and the mouth parts resemble very closely those of *N. unguiculatus*. The basal plate of the second maxilliped carries six (instead of five) setae.

The first legs agree exactly in the proportions of the segments with those of *N. unguiculatus*. There appears to be but one tooth on the outer margin of the ischium and merus respectively,

and only four teeth on the outer side of the basis. Only two teeth were observed on the basis of the second leg. In all of these cases, however, the teeth are exceedingly transparent and difficult to see, and it is possible that some may have been broken off in the process of cleaning the appendages from the mud with which they were encrusted.

In the remaining legs the basis is distinctly longer than in *N. unguiculatus*. In the third pair it is equal in length to the distal segments together, and in the fourth (Pl. I., fig. 16) and fifth pairs it is nearly two-thirds of their length. The claw is shorter and less curved, and the division between it and the terminal segment of the limb is obsolete.

The uropods (Pl. I., fig. 18) are very short, their total length, excluding the terminal spine, being about two-thirds the length of the last two somites together. The peduncle is hardly longer than it is broad at the distal end, and bears a bunch of fine setae on its inner margin. The endopod is only half as long again as the peduncle. Its inner margin is coarsely serrated, the teeth being directed somewhat towards the dorsal side. The outer edge is also serrated, especially towards the distal end. The terminal spine is short and stout, about one-third of the length of the endopodite. The exopodite is stout, about two-fifths the length of the endopodite, its basal segment very distinct.

Male.—Total length, 1.95 mm.

The male resembles that of *N. unguiculatus* very closely in general form except that the abdomen is much shorter. The form of the antero-lateral angle is very similar, and though the surface of the carapace is less coarsely granular than is represented in Sars' figures, it agrees in this respect with specimens of *N. unguiculatus* from the same gathering. The scattered setae on the surface are more numerous than in that species, and the serrations on the dorsal surface of the abdominal somites are less distinct.

In the posterior pairs of thoracic legs the basis is relatively longer than in *N. unguiculatus*, that of the fourth pair (Pl. I., fig. 17) being but little shorter than the remaining segments of the limb together.

The uropods (Pl. I., fig. 19) are much shorter and stouter than in *N. unguiculatus*, being about three-quarters the combined length of the last two somites. The peduncle is about two-thirds as broad as long, and a little more than half the length of the endopod. The latter is strongly serrated on its inner edge, and bears a serrated crest on the upper surface near the outer edge. The terminal spine is less than one-third the length of the endopod. The exopod is about one-third the length of the endopod.

No pigment is visible on the body, although specimens of *N. unguiculatus* in the same gathering are darkly pigmented. The eye pigment is also much less dark, of a reddish-brown colour, while that of *N. unguiculatus* is of a purplish black.

Occurrence.—Two females and one adult male from Ballynakill Harbour.

GENUS *Cumellopsis*, nov.

Resembling *Campylaspis* in general shape, but more slender. Carapace not so strongly vaulted as in that genus. Antennal tooth strongly produced. Mandibles with stout truncated molar process. Maxillulae not very strong. Maxillae of normal form with two movable endites. First maxillipeds with basis, merus, carpus, propodus and dactylus distinct, and of the usual form. Branchial apparatus well-developed. Second maxillipeds not expanded, ischium distinct, propodus articulating with distal end of carpus, terminal segment of moderate size, with a single apical spine. Third maxillipeds normal.

The species for which this new genus is proposed resembles in general appearance a somewhat slender *Campylaspis*, but it differs widely from that genus in the structure of its mouth-parts, returning in fact to what Bonnier calls "la désespérante uniformité des appendices buccaux dans tout le groupe des Cumacés."

Hansen's *Campylaspis carinata*, concerning which Sars has expressed the opinion that it probably belongs to the *Nannastacidae*, may, perhaps, be referred to the new genus defined above. There is a specimen (the second known) in the Museum of University College, Dundee, and I am indebted to Professor D'Arcy W. Thompson, C.B., for permission to examine and partly dissect it. It possesses a stout, truncated molar process, first maxillipeds fully developed, and second maxillipeds with distinct ischium, in all these characters agreeing with the present genus, while it somewhat resembles the species described below in the general shape of the carapace. The maxilla was not examined, but the second and third maxillipeds resemble in shape rather those of *Cumella* and *Nannastacus*, and there is a large, well-developed eye.

Cumellopsis Helgae, n. sp.

Plate II., figs. 20-24.

External characters (including uropods) described from *Female* with developing oostegites; total length, 5.8 mm. All other appendages from young *Male*, 4.7 mm. total length.

The carapace (Pl. II., figs. 20 and 21) is one-third of the total length, slightly depressed. Seen from above it is widest posteriorly, where the width is two-thirds of the length, and a little greater than the depth. The dorsal outline is not very strongly arched. The pseudorostrum is upturned and pointed as seen from the side, squarely truncate from above. There is no eye, and the ocular lobe is very small, the lateral plates of the pseudorostrum meeting in front of it for a distance equal to about one-eighth the length of the carapace. The antennal notch is widely open and angular, defined by a prominent acute tooth, which has one or two serrations on its lower margin and reaches as far forward as the tip of the pseudorostrum. There is a slight median keel posteriorly on the dorsal surface of the

carapace and a transverse elevation on the cephalic lobe. On each side of the carapace is a broad shallow longitudinal depression bounded above and below by low rounded ridges of which the upper is continued on to the pseudorostrum while the lower ends anteriorly in the antennal tooth. Posteriorly the depression is not defined, but dies out towards the posterior margin of the carapace. The first two thoracic somites are very short and are not produced dorsally.

The abdomen is moderately stout, cylindrical, a little longer than the cephalothoracic region, the penultimate somite nearly three times as long as broad and about twice as long as the last somite.

The antennules (Pl. II., fig. 22) have the proximal segment of the peduncle shorter than the other two together, the outer flagellum of three segments, and the very short inner flagellum of two distinct segments.

The anterior lip (Pl. II., fig. 22) is not prominent.

Mandibles (Pl. II., fig. 23) of normal type, molar process well developed, incisor process not enlarged, about six spines present.

Lower lip (Pl. II., fig. 24) with incurved tips to the lobes, each armed with three serrated laminar spines.

Maxillulae (Pl. II., fig. 25) with anterior lobe not specially broad, palp carrying two setae. Maxillae (Pl. II., fig. 26) of normal structure.

First maxillipeds (Pl. II., fig. 27) fully developed. Basis not much shorter than the remaining segments together, its distal process well developed. On the posterior surface of the segment there is a strong angular elevation near the distal end. Ischium not distinct. Branchial apparatus well developed, with 10 branchial lobules in the (immature) specimen dissected. Anterior division rather broad.

Second maxillipeds (Pl. II., fig. 28) with basis not expanded, equal in length to the remaining segments. Ischium distinct, carpus and propodus not modified as in *Campylaspis*. Dactylus bearing a single stout terminal spine.

Third maxillipeds (Pl. II., fig. 29) with the basis one and a half times the length of the remaining segments. Merus not greatly expanded, not longer than the carpus.

First legs (Pl. II., fig. 30) about as long as the carapace. Basis a little shorter than the remaining segments together. The merus has a stout tooth on its outer edge. The propodus is a little shorter than the carpus, and nearly twice as long as the dactylus. The terminal claw is long and slender.

The second legs (Pl. II., fig. 31) have the basis about equal to the succeeding segments. The terminal segment is little more than twice the length of the preceding segment, with one pair of lateral and a group of terminal setae.

In the third legs the basis is equal to the remaining segments; in the fourth (Pl. II., fig. 32) it is a little less, and in the fifth (Pl. II., fig. 33) it is little more than half that length. The carpus is rather long in all these legs, that of the last pair being twice the length of the merus.

The uropods are considerably longer than the last two somites together. The peduncle is slender and nearly twice the length of the endopod, which has four spines on the inner edge and a stout terminal spine. The exopod is three-fourths the length of the endopod.

Occurrence.—One female and two young males from 382 fathoms.

GENUS *Platycuma*, nov.

Carapace depressed, expanded and thinned away to a sharp edge on each side, produced backwards in the middle line and overhanging the anterior thoracic somites. Mouth-parts closely resembling those of *Cumellopsis*. Male without lateral grooves on abdomen, flagellum of antenna not reaching beyond cephalo-thoracic region, thickened towards the base, the segments short.

The species dealt with below agrees closely with *Cumellopsis* in the details of its appendages, and especially of its mouth-parts. The specimens are adult males, while *Cumellopsis* is founded upon females and immature males. Nevertheless, I venture to regard the species as representing a distinct genus mainly on account of the very peculiar form of its carapace. Its internal structure is very anomalous as regards the disposition of the alimentary canal.

Platycuma Holti, n. sp.

Pl. III., figs. 39-56.

Male. Total length, 4.1 mm.

Carapace (Pl. III., figs 39 and 40) a little less than one-half of the total length, very broad and depressed. Its greatest depth in the middle line is less than one-half of its length, and it thins away rapidly on either side to the sharp-edged lateral wings. Seen from above it is roughly quadrangular in outline, the lateral margins being nearly parallel, and the width about seven-eighths of the length. The lateral margins are slightly convex, but with a slight concavity just behind the rectangular antero-lateral corners. The anterior margin is convex on either side with a deep concavity in the middle, within which is the squarely truncate pseudorostrum, not reaching as far forward as the antero-lateral angles. The hinder margin from above appears trilobed, the lateral wings projecting backwards as rounded lobes, while in the middle line the carapace is produced backwards as a prominent lobe overhanging the anterior thoracic somites. There is no ocular lobe, nor any trace of visual organ. The lateral plates meet in front of the cephalic lobe for a distance equal to one-eighth of the length of the carapace. Seen from the side, the dorsal surface is very slightly arched, and the short pseudorostrum slightly upturned.

The integument is very transparent, showing in parts a faintly marked vermiculated texture like that figured by Bonnier in *Procampylaspis armata*. A few minute setae are scattered over the surface of the carapace.

Five thoracic somites are distinct (Pl. III., fig. 41), but the first two are completely, and the third partially, concealed by the backward prolongation of the carapace. All except the first have the pleural plates expanded laterally, each bearing two or three longish setae. The last two somites have a double dorsal crest similar to that of the abdominal somites.

The abdomen is less than one-half the total length, the somites sub-cylindrical, the penultimate not greatly longer than the preceding. There is no lateral groove, but each somite except the last bears a pair of dorsal crests, very thin and transparent, with irregularly serrate margins. The last somite is short and somewhat expanded and depressed.

The antennules (Pl. III., fig. 42) are rather large. The first segment of the peduncle is equal to the second and third together. The outer flagellum is shorter than the last segment of the peduncle, and consists of three segments. The inner flagellum is minute, and consists of two segments, of which the proximal is very small.

The antennae (Pl. III., fig. 43) are remarkable for the shortness of the flagellum, which does not extend beyond the penultimate thoracic somite in the natural position, and for the unusual length and abundance of the sensory hairs. The last segment of the peduncle is but little longer than the preceding, and about two-and-a-half times as long as broad. The sensory hairs which clothe the anterior surface of these two segments are very numerous and of great length. The flagellum is very thick at the base, and its segments bear very numerous and long sensory hairs.

The upper lip was not dissected out, but so far as could be seen it is not produced in front.

Mandibles (Pl. III., fig. 44) quite normal in type, with well-formed molar tubercle, about nine spines behind the cutting edge, and a lacinia mobilis on the left side.

Lower lip (Pl. III., fig. 45) with the tips incurved and each armed with a group of flattened serrated spines.

Maxillula (Pl. III., fig. 46) with the lobes less strong than in *Campylaspis*. Palp longer than the distance from its base to the tip of the distal lobe, carrying a single terminal seta.

Maxilla (Pl. III., fig. 47) with all the parts typically developed and with the setae of the distal margins more numerous than in *Procampylaspis*.

The first maxilliped (Pl. III., figs. 48 and 49) is also fully developed. The basis is little more than half the length of the remaining segments. Its distal process is concealed beneath the succeeding segments when viewed from below. There are four segments beyond the basis, the ischium being suppressed. The terminal segment is not expanded.

The posterior division of the branchial apparatus (Pl. III., fig. 48) bears a solitary lobule and the anterior division is expanded at the base.

The second maxilliped (Pl. III., fig. 50) has the basis rather longer than the remaining segments together. The ischium (Pl. III., fig. 50A) is distinct though short. The distal segments are not distorted as in *Campylaspis*, and the terminal segment bears at the tip a single curved claw with one or two setae.

The third maxilliped (Pl. III., fig. 51) has the basis slightly curved, and about equal to the remaining segments. It is not produced distally. The ischium is distinct but small. The merus is very little expanded, and is not produced distally. The distal segments are slender.

The first legs (Pl. III., fig. 52) are rather long, extending beyond the anterolateral angle by the length of the last two segments. The basis is stout, rather less than two-thirds the length of the remaining segments, and bears a strong spine at its distal end internally. The ischium is but half, the carpus nearly twice, the length of the merus. The two distal segments are slender, the propodus subequal to, and the dactylus one-third of, the length of the merus. There is a long and slender terminal claw. The exopod is about equal in length to the basis.

The second legs (Pl. III., fig. 53) have the basis expanded and a little shorter than the remaining segments, which are slender. The ischium, merus and propodus are short, the carpus more than twice the length of the merus and bearing a strong spine distally on the inner side. The dactylus is about three-and-a-half times the length of the propodus, with three terminal and two pairs of lateral feathered spines. The exopod is longer by one-fourth than the basis.

The third and fourth legs (Pl. III. fig. 54) have the expanded basis a little shorter than the remaining segments. The ischium and merus are short, the carpus nearly twice as long as the two together, the propodus about two-fifths the length of the carpus, and the dactylus very small, bearing a long, slender curved terminal claw. The exopod is a little longer than the basis.

The fifth legs (Pl. III., fig. 55) are similar to the preceding pair, except that there is no exopod, and the basis is slender.

The uropods (Pl. III., fig. 56) are longer than the last four somites together. The peduncle is moderately stout, and nearly one and a half times the length of the endopod. The latter is stout, serrated on the inner margin, and bears three or four spines internally, and a short stout terminal spine flanked by two small ones. The exopod is slender, about two-thirds the length of the endopod, with a slender terminal spine and a small spinule external to it.

The internal structure presents several very exceptional features. The thinness and transparency of the carapace allowed it to be observed that the gut was spirally coiled in the cephalothoracic region (Pl. III., fig. 40), and the fact was confirmed by dissection (Pl. III., fig. 41), though the fragility of the parts

rendered a close examination difficult. The anterior portion of the gut, corresponding probably to the chitin-lined fore-gut, runs nearly straight backwards, with a slight inclination to the left. Behind the middle of the carapace it turns sharply to the right, then curving upwards and forwards it forms a right-handed spiral of two and a half turns, not quite in a plane, the outermost whorl lying a little to the left and passing straight backwards into the abdomen. The straight anterior portion is a little wider than the rest, and there is a slight constriction at the beginning of the spiral, beyond which the diameter remains fairly uniform. The whole of this portion of the gut is distended with a very fine-grained mud, in which the only recognizable particles of organic origin are numerous coccoliths* and fragments of the shells of *Peridinia*.

No trace of hepatic caeca could be discovered. While it is possible and even probable that some vestiges of them may have escaped detection, it is certain that they must be exceedingly reduced.

The heart (seen lying behind the coiled gut in Pl. III., fig. 41) is much abbreviated and almost globular instead of fusiform as in most other Cumacea. This point is of importance, since the elongated form of the heart is a very general character of the group *Peracarida*, to which the Cumacea belong.† Only one pair of ostia could be discovered.

The ventral nerve-chain in the thoracic region is remarkable for the wide separation of the longitudinal connectives, and the transversely elongated form of the pairs of ganglia.

The male genital apertures were visible as a pair of crescentic slits on the sternal surface, close to the bases of the last pair of legs. It is, perhaps, worthy of note that they are not set on elevations of any kind, since the presence of tubular processes for the openings of the vasa deferentia has been supposed to be characteristic of the group *Peracarida*.‡

Occurrence.—Two male specimens from 382 fath.

Procampylaspis armata, Bonnier.

Procampylaspis armata, Bonnier, Ann. Univ. Lyon, xxvi., Campagne du "Caudan," p. 541, pl. xxix., fig. 1, 1896.

I have recorded under this name a large number of specimens, of which the adult females and the young of both sexes agree with Bonnier's account, except in their smaller size (adult ♀ 2.75 mm., Bonnier's immature ♂ nearly 5 mm.), and in the fact that the abdominal somites are rough with spiniform granules. The dorsal spine of the carapace, when perfect, is seen to be bifid at

* Mr. V. H. Blackman, of the Botanical Department of the British Museum, has kindly identified these for me as belonging to the species *Coccosphaera leptopora*, Murray and Blackman.

† Colman, Ann. Mag. Nat. Hist. (7) xiii., p. 157 (1904).

‡ Colman, *l.c.*, p. 153.

the tip. A number of adult males (3.25 mm. long), however, resemble Bonnier's *P. echinata* (t. c. p. 544, pl. xxix., fig. 2), so closely as to suggest that this species has been founded on an adult male of *P. armata*. I hope to deal with the characters of this species in greater detail elsewhere.

Occurrence.—In considerable numbers in gatherings at depths from 116 to 382 fathoms.

Distribution.—Bay of Biscay, 950 metres (Bonnier); Mediterranean, near Capri, 950–1,100 metres (Lo Bianco).

Campylaspis glabra, Sars.

Campylaspis glabra, G. O. Sars, Arch. Math. Naturvid. iv., p. 77, pls. xlv. xlvii. 1879; Crust. Norway, iii., p. 86, pl. lviii, 1900.

I refer these specimens to *C. glabra*, Sars, on account of their small size (3–4 mm.), whitish colour (with a tinge of pink in some cases), having the terminal segment of second legs slightly shorter than the two preceding, and the spines on the endopod of the uropods long and slender. On the other hand they resemble *C. rubicunda*, Lillj., in having the peduncle of the uropods distinctly serrated internally and the endopod a little less than half its length. I am disposed to regard *C. glabra* simply as a small variety of *C. rubicunda*.

Occurrence.—A few specimens from 116 and 200 fath.

Distribution.—Norway (Sars); off N. E. England (Brady); Mediterranean (Sars).

Campylaspis nitens, Bonnier. (?)

Campylaspis nitens, Bonnier, Ann. Univ. Lyon, xxvi., Campagne du Caudan, p. 538, Pl. xxviii., fig. 4, 1896.

Two immature female specimens are referred, with some hesitation, to this species, with which they agree in the reduced ocular lobe, without any trace of an eye, and in the general outline of the carapace, which projects backwards so far as to conceal almost entirely the first and second thoracic somites when viewed from the side. The pseudorostrum, when seen from above, is much more acute than in Bonnier's figure, but I am inclined to think that this figure (t.c. pl. xxviii., fig. 4 b) represents the carapace viewed obliquely from the front.

The uropods in the present specimens exceed in length the last four somites together, and the peduncle is a little less than three times the length of the endopod. Bonnier states that the uropods of his specimens were as long as the entire pleon, but his figure shows them as equal to not more than the last five somites. There is a slight discrepancy in his figures with respect to the relative lengths of peduncle and rami. The figure of the entire animal (4 a) shows the peduncle two and a half times the length of the endopod, which is not very different from the proportion

in our specimens, but in the enlarged figure (4 *v*) the endopod is almost exactly half the length of the peduncle. The endopod bears a much larger number (11) of spines in our specimens than in Bonnier's figure, and the inner edge of the peduncle has a few setae distally. The most serious discrepancy, however, is found in the fact that Bonnier describes and figures the terminal segment of the second legs as expanded and flattened. In our specimens it is slender and styliform, resembling Sars' figure of this appendage in *C. rubicunda*, though shorter than the two preceding segments together.

Bonnier's specimen was an immature male, a little less than 5 mm. in length. Our specimens are females, also immature, 4.5 mm. long.

Occurrence.—Three specimens from 320 fath.

Distribution.—Bay of Biscay, 950 metres (Bonnier).

***Campylaspis verrucosa*, G. O. Sars.**

Campylaspis verrucosa, G. O. Sars, Crust. Norway, iii., p. 90, pl. lxiii., 1900.

The majority of the specimens are immature and of small size (3.5 mm.) and differ considerably from the adult, especially in the relatively larger size of the bosses on the carapace and in the very short and stout uropods. A few nearly adult specimens agree well as regards the uropods with Sars' figures, but still present a larger number of bosses on the carapace, which moreover are not so regularly arranged in longitudinal rows. The antennal notch is much deeper than is shown by Sars. In these points our specimens are in agreement with an adult female specimen from the Mediterranean, which has been determined by Prof. Sars himself as belonging to the present species.

Occurrence.—In numbers in three gatherings from 120 to 320 fath.

Distribution.—Norway N. to Lofoten Is., 60-100 fath. (Sars); Mediterranean, near Capri, 200-1,100 metres (Lo Bianco).

***Campylaspis sulcata*, G. O. Sars.**

Campylaspis sulcata, G. O. Sars, Crust. Norway, iii., p. 86, pl. lix., 1900.

Occurrence.—In numbers at three stations from 130 to 199 fathoms.

Distribution.—Norway, N. to Lofoten Is. 120-250 fath. (Sars); Mediterranean, Gulf of Naples, 130 metres (Lo Bianco).

***Campylaspis rostrata*, n. sp.**

Pl. II., figs. 35-38.

Female with rudimentary oostegites. Total length, 5.25 mm.

Closely resembling *C. horrida*, Sars, in general shape, and in the armature of the carapace and the rest of the body, but having the pseudorostrum much longer and decurved. The ocular lobe

is very small, and is without pigment or visible ocular structure. The pseudorostral plates meet in front of it for a distance equal to three times its length. Seen from above the pseudorostrum is acutely triangular. Seen from the side it is horizontal at the base, then strongly curved downwards to the acutely pointed tip. On the dorsal surface are two pairs of small tubercles. The antennal notch is well marked. The sculpturing of the carapace is arranged in much the same manner as in *C. horrida*, but the tubercles of the dorsal surface are less numerous, and blunter. The abdominal somites resemble those of *C. horrida*, except that the fifth somite is like the preceding in having a pair of tubercles on the dorsal surface.

Second pair of legs (Pl. II., fig. 37) differing considerably from those of *C. horrida*, the basis only half the length of the remaining segments together, the carpus but little longer than the merus, the dactylus very long and slender, about equal in length to the three preceding segments together.

Uropods (Pl. II., fig. 38) similar in proportions to those of *C. horrida*, peduncle strongly serrated internally, less distinctly on its outer edge, about $2\frac{1}{2}$ times the length of the endopod.

It is possible that a series of specimens might show variations connecting this species with *C. horrida*, but at present the differences in the shape of the pseudorostrum and of the second legs would seem to be of specific value.

Occurrence.—One specimen, from 320 fathoms

FAMILY PSEUDOCUMIDAE.

***Pseudocuma longicornis* (Spence Bate).**

P. cercaria (Van Beneden), G. O. Sars, Crust. Norway, iii. p. 74, pls. li. & lii., 1900.

Occurrence.—This is the most abundant species in the collection, occurring in 64 gatherings, and sometimes in great numbers.

Distribution.—Norway, N., to Lofoten Is. (Sars); Kattegat (Meinert), Heligoland (Ehrenbaum); Holland (Van Beneden); abundant all round British Is.; N. & E. coasts of France (Bonnier); Mediterranean (Sars, Walker).

***Pseudocuma similis*, G. O. Sars.**

P. similis, G. O. Sars, Crust. Norway, iii., p. 76, pl. liii., 1900.

This species is distinguished from the preceding by very slight characters, but these appear to be constant in the specimens I have examined.

Occurrence.—Two adult males and one female, from different gatherings from shallow water. It is possible that some specimens may have been overlooked in other gatherings of the last species, in company with which this species usually occurs.

Distribution.—Skudesnaes, Norway (Sars); North Sea (Zimmer); Forth, Clyde, Aberdeen, Moray Firth, Fair I. (Scott), N.E. England (Brady).

FAMILY CERATOCUMIDAE, nov.

Telson distinct, small. without spines. First and second legs in the male with exopods. All the abdominal somites of the male with well-developed appendages. Uropods with the inner ramus unjointed.

It may be thought somewhat hazardous to establish a new family for the reception of a single species of Cumacean, of which only one sex is known. The form described below, however, offers a combination of characters which excludes it from all the families as at present defined. In the distinct but unarmed telson it resembles the *Pseudocumidae*; in having a full series of pleopods in the male it agrees with the *Bodotriidae* and *Vauntopsoniidae*; the unjointed endopod of the uropods it shares with the *Nannastacidae*, *Pseudocumidae*, and certain of the *Bodotriidae*; while in having two pairs of legs with exopods in the male, it differs from all the families, the *Bodotriidae* having but one pair, while all the other families have four. The posterior thoracic limbs, in the possession of a stout curved terminal claw and in the absence of long setae from the distal segments, resemble those of *Nannastacus* and *Cumella*, but here also the other characters offer no evidence of close affinity.

GENUS *Ceratocuma*, nov.

With the characters of the family.

Ceratocuma horrida, n. sp.

Pl. IV., figs. 57 75.

Adult male. Total length, 4.05 mm.

Carapace a little more than one-third of the total length slightly depressed, its depth equal to and its breadth greater than one-half of its length, armed with large curved spiniform processes pointing forwards. Three pairs of these processes are set upon the dorsal surface, the most anterior at a distance of more than one-third the length of the carapace from the front; eight more are on each side, six forming a longitudinal series, of which the most anterior is just below and at the side of the pseudorostrum, while two are set at a lower level on the posterior part of the carapace. The pseudorostrum is horizontal, bluntly truncated as seen from above or from the side, not projecting beyond the tip of the anterior tooth of the lateral series. The lateral plates meet in front of the cephalic lobe for a distance about equal to one-sixth of the length of the carapace. The ocular lobe is reduced to a very small process on the cephalic lobe and there is no eye. The antero-lateral notch is widely open. The antero-lateral angle projects as far forward as the pseudorostrum, and appears to be double, there being immediately external to and below it a triangular tooth from which a strongly marked longitudinal ridge runs backwards on the side of the carapace.

Five thoracic somites are free behind the carapace, the first being completely exposed and equal in size to the second. Each somite except the first bears a pair of dorsal and a pair of lateral spines, long and curved forwards on the anterior somites, shorter and directed obliquely backwards on the hinder ones. The lateral spines of the second and third free somites are expanded at the base where they overhang the small coxal segments of the legs, and are hollowed out underneath to form a channel in which lies the terminal part of the antennal flagellum. The last thoracic somite (Pl. IV., fig. 72) is devoid of any trace of limbs. On its under side are two rounded eminences in contact with each other in the middle line bearing the crescentic slit-like apertures of the vasa deferentia. Just anterior to these is a median spine.

The abdomen is a little shorter than the anterior division of the body. The first four somites are constricted in the middle as seen from above, and bear each a pair of backwardly directed blunt spines near the posterior end on the dorsal surface. The fifth somite is nearly twice the length of the preceding, and is without the dorsal spines. The pleural plates of the first five somites are very small, forming merely a triangular tooth external to the insertion of each of the pleopods. The sixth somite is about one-third the length of the fifth. The telson (Pl. IV., fig. 75) is a little shorter than the last somite, its sides slightly converging posteriorly and its hinder margin broadly rounded. Its dorsal surface is somewhat arched posteriorly and bears a pair of minute setae. The telson is articulated to the sixth somite in such a way that it can be depressed into a vertical position, shutting over the anal opening and taking the function of the usual anal valves which in this case appear to be absent or very slightly developed (Pl. IV., figs. 76, 76A).

The antennules (Pl. IV., fig. 59) have the basal segment of the peduncle about twice as long as the other two segments together. The outer flagellum consists of four segments and the inner of one which is shorter than the first segment of the outer flagellum. Both flagella are provided with numerous sensory hairs.

The antenna (Pl. IV., fig. 60) has the two distal segments of the peduncle rather slender, the distal about twice as long as the preceding. The flagellum is short, not reaching beyond the last thoracic somite in the natural position.

The mandibles (Pl. IV., fig. 61) are of the normal type and bear about fifteen spines. Lower lip (Pl. IV., fig. 62) with tips of the lobes incurved, bearing each a group of lamellar setae. The maxillula (Pl. IV., fig. 63) has a rather stout palp, its length about twice the distance from its base to the tip of the distal lobe, bearing two setae. The maxilla (Pl. IV., fig. 64) is of the usual form.

The first maxilliped (Pl. IV., figs. 65 and 65A) has the basis shorter than the remaining segments. Its inner margin is strongly inflected so that its distal prolongation is hidden by the succeeding segments when the limb is seen from below.

The branchial apparatus was much shrivelled by the action of the preservative and could not be isolated in a sufficiently complete

state to admit of a figure being given. The posterior division (epipod) is very broad anteriorly and narrows towards its posterior end. Only one branchial lobule was visible.

The second maxilliped (Pl. IV., fig. 66) has the basis more than one and a half times the length of the remaining segments. The ischium is distinct though very small.

The third maxilliped (Pl. IV., fig. 67) is long and slender. The basis is about one and three quarter times the length of the remaining segments. It is narrowed distally, and is not produced at its distal end.

The first leg (Pl. IV., fig. 68) is somewhat stout and extends only a little way beyond the tip of the pseudorostrum. The basis is shorter than the remaining segments together. The ischium is longer by one-half than the merus, and the two together are equal to the carpus, which again is nearly twice as long as the propodus and dactylus together. The ischium, merus, and carpus are of equal breadth and somewhat flattened, especially the last-named, and on the inner edge of each is a transparent laminar crest with an irregularly serrate margin. A similar crest is developed on the distal part of the outer end of the basis. Less conspicuous crests are also found on the inner edge of the two distal segments, that on the dactylopodite being clearly made up of flattened laminar spines set edge to edge in a row. The propodus bears on its outer side two very peculiar structures which are probably organs of sense (Pl. IV., fig. 68A). One is placed about the middle of its length and the other at the distal end. Each consists of a short thick cylindrical process directed towards the distal extremity of the segment, enclosed for about one-half of its length within a socket or hood-like expansion of the integument. The distal end of each process is obliquely truncated and rounded, and bears, mainly on the side which in the natural position of the limb is upwards and inwards, a dense tuft of very fine and stiffly radiating setae. A stouter seta springs from the end of each of the processes. The dactylus bears a slender curved claw a little longer than the segment and several stout setae. The exopod is a little longer than the basis.

The second, like the succeeding legs, is very slender (Pl. IV., fig. 69). The basis is about equal in length to the remaining segments, is expanded near the base, then narrows rapidly to about the middle of its length, beyond which it is no thicker than the succeeding segments. The carpus is very long, about two and a half times the length of the propodus and dactylus together. The dactylus has two terminal setae and some shorter setae on its inner edge. The exopod is less than two-thirds the length of the basis.

The third (Plate IV., fig. 70) and fourth (Pl. IV., fig. 71) legs are slender. The basis of the third is three-fourths, that of the fourth less than half the length of the remaining segments. The difference is due to the greater length in the fourth leg of the carpus and propodus, which in both legs are subequal in

length. The daetylus in each bears a stout, curved, claw-like spine with a shorter seta on the inner side. Only a few short setae are scattered on the remaining segments.

The pleopods (Pl. IV., figs. 73-74) are rather feebly developed and the last pair are much shorter than the preceding.

The uropods (Pl. IV., fig. 75) are equal to a little over two-fifths of the length of the body. This great length is mainly owing to the unusual development of the subequal rami which are about three and a half times the length of the peduncle. Both rami are slender, tapering to a fine point. They are finely serrate on their inner edges and each ends in a minute terminal spine. The endopod is unsegmented, and the basal segment of the exopod is very small.

The texture of the integument on the body is coarsely reticulate with fairly regular hexagonal meshes.

Immature male. Total length, 3.35 mm.

The pleopods are rudimentary, indistinctly bilobed. The processes on the carapace and surface of the body are low, blunt and rounded tubercles. The last thoracic somite is without limbs, and the prominences for the openings of the vasa deferentia are not developed. The uropods are relatively much shorter than in the adult, being about one quarter of the total length, and the rami are only two and a half times the length of the peduncle.

Apart from the characters mentioned above as distinctive of the family, the very peculiar "sensory" brushes on the first legs and the absence of appendages from the last thoracic somite are perhaps the most striking features of the form now described. As regards the latter point, the absence of the fifth pair of legs (a larval character) in specimens of nearly adult size has been described as distinguishing the species *Leptostylis manca*, Sars, *Campylaspis nodulosa*, Sars, and *Diastylis anomala*, Bonnier. Zimmer,* however, found that a specimen of *Leptostylis manca* considerably larger than Sars' type had this pair of appendages well developed, and it is possible that in the other two species also the development is only delayed, not suppressed. In the specimens above described the evidence of maturity is stronger. The apparently full development of the antennae and pleopods with their setae, and the distinctness of the slit-like genital openings render it very unlikely that the specimen can be so far from the adult state as to admit of the development of a pair of limbs of which no traces are yet visible.

Occurrence.—Two adult males and one immature from 382 fathoms.

*Camaccen. Hamburger Magalhãesischen Sammelreise, p. 8. 1902.

FAMILY LAMPROPIDAE.

Lamprops fasciata, G. O. Sars.

L. fasciata, G. O. Sars, Crust. Norway, iii., p. 19, pls. ix. & x., 1899.

Occurrence.—Two adult females from the East coast.

Distribution.—Norway, N. to Vadsö (Sars), Kattegat (Meinert); Heligoland (Ehrenbaum); Britain, Forth, Moray Firth, Clyde (T. Scott), Irish Sea (Walker). Shallow water.

Hemilamprops rosea (Norman).

H. rosea, G. O. Sars, Crust. Norway, iii., p. 22, pls. xii.-xiv., 1899.

The specimens which I refer to this species show all the characters which Sars enumerates as distinguishing *H. rosea* from *H. assimilis*, except that the pigmentation of the body is almost absent, and the eye, though well developed, is nearly colourless. Sars gives 20-50 fathoms as the range in depth of this species, while *H. assimilis* is stated to replace it in from 60-200 fathoms.

Occurrence.—In numbers, at six stations, from 27-199 fathoms.

Distribution.—Norway, N. to Vadsö (Sars); Britain, Shetland (Norman), Fair I., Clyde (Scott), Tynemouth, Lough Foyle (Norman). *H. assimilis* is recorded from Finmark (Sars), 60-200 fathoms, and Irish Sea, off Co. Cork, depth not given (Walker).

Hemilamprops uniplicata, G. O. Sars.

H. uniplicata, G. O. Sars, Crust. Norway, iii., p. 24, pls. xvi. & xvii., 1899.

Occurrence.—Several specimens from 199 fathoms.

Distribution.—Norway, N. to Lofoten Is. and Norwegian N. Atlantic, 60-417 faths. (Sars). The species is recorded, with an indication of doubt, from E. Loch Tarbert (L. Fyne), by Brook and Scott (Rep. Fishery Board, Scotland, IV., p. 239, 1886), but I am not aware that its occurrence there has been confirmed.

Hemilamprops cristata, G. O. Sars.

H. cristata, G. O. Sars, Crust. Norway, iii., p. 25, pl. xviii., 1900.

Most of the specimens differ slightly from Sars' account as regards the telson. This is less narrowed distally, with the sides nearly straight, and with three (♂), four, or five (♀) pairs of lateral spines. The three apical spines are not greatly longer than the others, and the median one is sometimes a little longer than the other two. Further, the eye is without pigment in all the specimens, but whether or not this is due to the action of the preservatives, I am unable to say. In all the points named our specimens tend to approach *H. Normani*, Bonnier, which has 6-8 pairs of lateral spines on the telson, and the median apical spine much larger than the others. Bonnier's is a larger species, immature specimens measuring 10 mm. in length, while Sars

gives 7 mm. as the size of *H. cristata*, and our specimens are about the same size. Nevertheless, I suspect that Bonnier's species will prove to be a synonym of the present.

Occurrence.—This is one of the most abundant species in the gatherings from deep water. It occurred at four stations from 199–382 fathoms.

Distribution.—Norway, N. to Lofoten, in depths over 100 fath. (Sars); S. of Rockall, 630 fath. (Norman). *H. Normani* is recorded from the Bay of Biscay, 650–950 metres (Bonnier).

FAMILY PLATYASPIDAE.

GENUS *Platyaspis*, G. O. Sars.

Only one species of this genus has hitherto been described. A second occurs in the present collection and is described below. The following synopsis compares the characters of the two species :—

Carapace longer than broad, narrowed in front (♀) or behind (♂). Pseudorostrum horizontal, triangular. A median keel on dorsal surface of carapace. Antennules from one-fourth (♀) to one-third (♂) of length of carapace, outer flagellum with 3 (♀) or 5 (♂) segments, inner with 2 (♀) or 3 (♂). Antenna (♀) with terminal segment not enlarged, shorter than the proximal segments together. Basis of third maxillipeds longer than terminal part of limb.

P. typica, G. O. Sars.

Carapace sub-circular, slightly broader than long. Pseudorostrum upturned, notched. A median keel anteriorly, and a pair of admedian ridges posteriorly on dorsal surface of carapace. Antennules nearly as long as the carapace, both flagella of four segments. Antennae having the terminal segment enlarged, one and a half times as long as proximal segments. Basis of third maxillipeds shorter than terminal part of limb.

P. orbicularis, n. sp.

Platyaspis typica, G. O. Sars.

P. typica, G. O. Sars, Crust. Norway, iii., p. 27, pls. xix. and xx. 1900.

In immature specimens of both sexes the first free thoracic somite is much shorter and its pleural plates less expanded than in the adults. There is a distinct double dorsal keel on the second somite, which is not, however, continued on to the posterior thoracic and anterior abdominal somites as it is in some Mediterranean specimens which I have examined.

Occurrence.—Many specimens of both sexes from 199 and 382 fathoms.

Distribution.—Norway, North, to Lofoten Is., 120–400 fathoms (Sars); Mediterranean, near Capri, 950–1,100 metres (Lo Bianco).

Platyaspis crbicularis, n. sp.

Plate V., figs. 77-81.

Immature female (much injured). Carapace 1.75 mm. long, 1.8 mm. broad.

Carapace, viewed from above, nearly circular in outline. The transverse width very slightly greater than the length in the middle line. The pseudorostrum is very short, distinctly upturned, with a median notch when viewed from above. There is a median keel on the dorsal surface extending from the frontal lobe backwards to about the middle of the carapace, behind which the surface is depressed in the middle line, with a distinct ridge on either side.

The first free thoracic somite is very small, and the pleural plates are not expanded.*

Antennules (Pl. V., figs. 78 and 80) of very great size, measuring from the base about six-sevenths the length of the carapace. The peduncle is stout, the first segment equal in length to the other two together. All three beset with numerous long setae. The flagella equal in length, and a little over two-thirds the length of the peduncle, each composed of four segments, the first three long, the terminal one minute.

Antennae (Pl. V., figs. 78 and 81) also remarkably developed, about one-third the length of antennules, consisting of four segments of which the distal is more than half as long again as the others together, and fusiform in shape. The first segment bears two long plumose setae, the second, one.

The third maxillipeds have their distal segments more elongated than in *P. typica*, the basis being a little less than half the total length of the limb.

I have ventured to describe this species as new from a fragmentary and immature specimen, since its characters are so striking that there can be little difficulty in recognising it again.

Occurrence.—One specimen from 382 fathoms.

FAMILY *DIASTYLIDAE*.**Diastylis cornuta** (Boeck).

D. cornuta, G. O. Sars, Crust. Norway, iii., p. 45, pls. xxxv. and xxxvi., 1900.

None of the specimens agree perfectly with Sars' figures, but as none are ovigerous, the differences are probably due to age. The number of spines on the telson and on the peduncle and endopod of the uropods increases with growth. There is also considerable variation, not altogether dependent on age, in the degree of spinulation of the carapace and abdomen. In the largest specimens the first pair of legs are a little longer than in Sars' figure.

* This may be due to immaturity, see remarks on *P. typica* above.

Occurrence.—Abundant in several of the gatherings from 116–200 fathoms.

Distribution.—Norway, N. to Lofoten Is., 50–300 fathoms, "One of our most common species" (Sars); Kattegat (Meinert); Shetland (Spence Bate), Fair Isle (Scott), Lough Foyle, 15 fathoms (Norman); Cap Breton (Fischer); 55°40 N., 12°46 W., 1,476 fathoms (Norman).

Diastylis Josephinae, G. O. Sars.

D. Josephinae, G. O. Sars, Kgl. Svenska Vet. Akad. Handl. ix, No. 13, p. 36, pl. xv, figs. 72–74, 1871.

The first legs, which were wanting in the single type specimen described by Sars, attain in this species a development comparable to that found in *D. longipes*, from which the present form is distinguished by the spinose surface of the body and of the basal segments of the legs. In the uropods the relative lengths of the rami vary with age and sex. In young specimens 7 mm. long they are subequal. In an ovigerous female 11·4 mm. long the exopod reaches only to the base of the distal segment of the endopod, and in an immature male of about the same size it reaches just beyond this. In the youngest specimens the endopod is composed of only two segments, but in large specimens the third segment is distinct. In the ovigerous female there are no lateral serrations on the anterior part of the telson, but on each side of the post-anal part there are 10–11 small teeth. This part is smooth in the other specimens.

Occurrence.—In moderate numbers from three stations, 199–382 fathoms.

Distribution.—Off coast of Portugal (Sars), to north of Farøe Is. (Norman) 344–750 fathoms. "It seems to be the commonest Cumacean inhabiting the deep waters between Farøe and Shetland" (Norman).

Diastylis echinata, Spence Bate.

D. echinata, G. O. Sars, Crust. Norway, iii, p. 57, pl. xliii, 1900.

The specimens agree very closely with Sars' account, except that the inner ramus of the uropods is composed of two instead of three segments. None of the specimens however are ovigerous.

Occurrence.—In numbers from 200 fathoms.

Distribution.—Norway, N. to West Finmark, Norwegian N. Atlantic (Sars); off Skagen Lighthouse (Meinert); off Shetland (Spence Bate); 60° 10 N., 2° 59 W. (Norman); 100–550 fathoms.

Diastylis insignis, G. O. Sars.

D. insignis, G. O. Sars, Kgl. Svenska Vet. Akad. Handl. ix, No. 13, p. 34, pl. xiv., 1871.

Occurrence.—Several specimens from 382 fathoms.

Distribution.—W. of Shetland, 250 fath. (Norman); off coast of Portugal, 550 fath. (Sars).

Diastylis rugosa, G. O. Sars.

D. rugosa, G. O. Sars, Arch. Math. Naturvid., iv., p. 46, pls. xxxiv-xxxviii, 1879; Crust. Norway, iii., p. 48, pl. xxxvii., 1900.

Occurrence.—A few specimens in five gatherings. Shallow water.

Distribution.—Norway, N., to Trondhjem (Sars), Kattegat (Meinert); Heligoland (Ehrenbaum); Firth of Forth, Clyde (Scott), Skye, Durham, Devon (Mus. Nor.), Lough Swilly, Valentia (Norman); France, Mediterranean, (G. O. Sars). Shallow water.

Diastylis rostrata (Goodsir).

D. rostrata, G. O. Sars, Crust. Norway, iii., p. 51, pl. xxxix., 1900.

Occurrence.—A few specimens from two stations in Ballynakill Harbour.

Distribution.—S. of Norway (Sars), Kattegat, (Meinert); Heligoland (Ehrenbaum); Firth of Forth (Goodsir), Clyde, Aberdeen, (Scott), Shetland, Moray Firth, Durham (Norman), Devon, Guernsey, Valentia (Mus. Nor.); $52^{\circ} 25' N.$, $11^{\circ} 40' W.$, 90 fath. $53^{\circ} 24' N.$, $15^{\circ} 24' W.$, 1,630 fath., $54^{\circ} 15' N.$, $11^{\circ} 9' W.$, 183 fath. (Norman). Generally in shallow water, except the last three localities.

Diastylis spinosa, Norman.

D. spinosa, Norman, Rep. Brit. Ass. for 1868, p. 271, 1869; Walker, Proc. Biol. Soc. Liverpool, iv., p. 247, 1890.

„ *bimarginatus*, Spence Bate, Ann. Mag. Nat. Hist., (5) i., p. 409, fig. 1; Sim, *op. cit.*, (5) ii., p. 453, pl. xviii., figs. 3-5, 1878.

„ *Bradyi*, Norman, Ann. Mag. Nat. Hist. (5) III., p. 59, 1879; Walker, Proc. Biol. Soc. Liverpool, ii., p. 178, pl. xiii., figs. 10 and 11, 1888.

The specimens here recorded appear to belong without doubt to the form described by Norman and by Walker under the name *D. Bradyi*, of which, according to Walker, *D. spinosa* (Norman) is the male.

Occurrence.—Three specimens from 30 fathoms, Ballinskelligs Bay, Co Kerry.

Distribution.—Shetland, Moray Frith, (Norman), Aberdeen (Spence Bate), Firth of Tay (W. T. C.), Forth, Clyde, Durham, Yorkshire, Devonshire (Mus. Nor.), Irish Sea (Walker), Lough Swilly, Valentia, West of Ireland, 90-183 fath. (Norman); Heligoland (Ehrenbaum).

***Diastylis tubulicauda*, n. sp.**

Plate V., figs. 82-86.

Young female (?). Total length 5.4 mm.

The single specimen is considerably damaged, the carapace being partly crushed. It is possible, therefore, that the relative depth of the carapace and the outline of its dorsal surface are not quite correctly shown in the figure.

The carapace is about one-fourth of the total length, its depth more than one half of its height. The dorsal surface is strongly arched. The pseudorostrum is acute, prominent, and horizontal. There is no eye. The surface of the carapace is beset with small spines (which, in the specimen examined, are nearly all broken off), their bases connected by a network of lines of minute granules, the centre of each mesh of the network being occupied by granulations (Pl. V., fig. 83). On the antero-lateral margin the spines are all broken, but on the posterior part of the lateral margin they are slender and form a comb-like series. Scattered here and there over the surface of the carapace are a few long setae.

The free thoracic somites as well as those of the abdomen are beset with spinules, and have the surface sculptured in the same way as the carapace. The third and fourth thoracic somites are quite distinct from each other. The abdomen is slender and exceeds by three-fifths the length of the cephalothoracic region. The telson (Pl. V., figs. 85 and 86) is of remarkable size and shape. It is equal in length to the four last abdominal somites together, and about two-thirds their thickness. It is cylindrical in form, of nearly the same diameter throughout. At its distal end the anal opening is guarded by a pair of well-marked anal valves laterally and by the triangular apex of the telson above. This triangular portion, which represents the post-anal portion of the telson in normal species of *Diastylis*, is quite short, not projecting beyond the anal valves; at the apex it bears a pair of very minute spinules, but the sides are quite unarmed. The proximal part of the telson is beset with spines similar to those of the rest of the surface of the body. On the dorsal surface they extend to about the middle of its length, but on the ventral surface they reach only a little way from the base.

The antennules are about three-fourths the length of the carapace, the first segment of the peduncle a little longer than either of the other two. Outer flagellum about half the length of the peduncle, inner flagellum less than half the length of the outer.

Mandible with elongated body and numerous spines as in the normal species of *Diastylis*.

First legs less than twice the length of the carapace, all the segments, except the last, spinulose. The dactylus is less than half the length of the propodus, which is sub-equal to the carpus. The exopod is a little shorter than the basis.

The second legs have the three distal segments very slender, all the segments, except the last two, spinulose, and the exopod very long, reaching to the base of the terminal segment of the endopod.

The next two pairs of legs (Pl. V., fig. 84) are very long and slender, exceeding the length of the carapace. The basis is about half the length of the leg, and, like the next two segments, is beset with spinules. Close to the proximal end it gives off a rudimentary exopod (Pl. V., fig. 84A). The last thoracic somite is without any trace of appendages in the specimen examined.

The uropods (Pl. V., fig. 85) are slender, and very little longer than the telson. The peduncle is one and a half times the length of the exopod, and is spinulose on its proximal half. The inner margin bears two setae near the distal end. The exopod is unarmed, except for four slender spines or setae at the apex, one of which is very long. The endopod is little more than half the length of the exopod, and consists of three segments, of which the first bears two, the second one, and the third three slender spines.

The great size and unusual shape of the telson distinguish this species from all the *Diastylidae* hitherto described. In some species the form of telson here found is approached by the elongation of the pre-anal tubular part, and the reduction of the post-anal part. In *Diastylis Josephinae* and *D. erinaceus* of Sars, and in *Diastylopsis* (?) *duina* of Bonnier, the post-anal portion is unarmed except for the apical spines. But in all these species the sides converge for some distance towards the apex, and the latter projects considerably beyond the anal aperture. The only species of *Diastylidae* yet described, in which there is no post-anal portion of the telson, is *Pachystylis rotundata* of Hansen, in which, however, the telson is quite short, and anal valves do not appear to be present. The absence of the last pair of legs is probably only an indication of immaturity, but it is just possible that it may persist in the adult (cf. *supra*, p. 40). The small size of the exopods of the third and fourth pairs of legs makes it very improbable that the specimen is a male, but on the other hand it is likely that they will be found to persist in the adult female. The characters of this peculiar form do not coincide with those of any of the admitted genera of *Diastylidae*, but it may, perhaps, be allowed to remain within the genus *Diastylis* pending the discovery of ampler and better material.

Occurrence.—One specimen from 382 fathoms.

***Diastylodes serrata* (G. O. Sars).**

D. serrata, G. O. Sars, Crust. Norway, iii., p. 61, pl. xlv., 1900.

Occurrence.—Abundant in two gatherings, from 199 & 320 fathoms.

Distribution.—Norway, N. to W. Finmark, 30–300 fath. (Sars); off Skagen Lighthouse (Meinert); off Yorkshire, 4–6 fath. (Brady); Mediterranean, near Capri, 950 metres (Lo Bianco).

Diastylodes biplicata (G. O. Sars).

D. biplicata, G. O. Sars, Crust. Norway, iii., p. 62, pl. xlvi., 1900.

Occurrence.—Abundant in six gatherings, from 120–382 fathoms.

Distribution.—Norway, N. to Lofoten Is., with “a very great range in depth” (Sars); Skagerrak & Kattegat (Meinert); Shetland (Norman), Fair I. (Scott), Skye (Norman), Clyde (Mus Nor.), off Sunderland, 45 fath., off West of Ireland, 183–1,630 fath. (Norman).

Leptostylis longimana (G. O. Sars).

L. longimana, G. O. Sars, Crust. Norway, iii., p. 68, pl. xlviii., 1900.

Occurrence.—Several specimens, at two stations, 199–382 fath.

Distribution.—Norway, N. to Lofoten Is., 30–100 fath. (Sars), Skagen (Meinert); Atlantic coast of N. America (Smith).

Leptostylis macrura (G. O. Sars).

L. macrura, G. O. Sars, Crust. Norway, iii., p. 69, pl. xlix., 1900.

Occurrence.—Abundant at 199 fath., and a few specimens at three other stations, 120 fath.

Distribution.—Norway, N. to Vadsö (Lofoten), 50–150 fath. Norwegian N. Atlantic, 525 fath. (Sars); Mediterranean, near Capri, 200 metres (Lo Bianco).

Diastylopsis, sp. indescr.

From two stations, in 199 and 382 fathoms, were obtained several specimens apparently belonging to a species which has lain for many years under a manuscript name in the collection of Canon Norman. As I have Canon Norman's permission to describe the species from his original specimens elsewhere, it would manifestly be inappropriate to do so here, and I shall therefore simply record the occurrence of the species. Canon Norman's specimens are from the Faröe Channel, 572 fathoms.

POSTSCRIPT.

While this paper was passing through the press I received an additional series of Cumacea, comprising thirty-six gatherings, taken, for the most part, during the past summer and autumn.

The contents of five of the more interesting gatherings from deep water are tabulated below. One species is added to the lists

already given, and it is worthy of note that *Iphinoë serrata* occurs at 244 fathoms, and *Eudorella truncatula* at 337 fathoms depth.

Date	Hour	Station No.	Depth in Fathoms	Depth at which Tow Net was worked	Locality.	<i>Cyclaspis longicauda</i>	<i>Iphinoë serrata</i>	<i>Eudorella truncatula</i>	<i>Procamptaspis armata</i>	<i>Camptaspis globosa</i>	<i>Camptaspis verrucosa</i>	<i>Hemithamprope rosea</i>	<i>Hemithamprope cristata</i>	<i>Dinastylla cornuta</i>	<i>Dinastylla Josephinae</i>	<i>Dinastylla tumida</i>	<i>Dinastyllodes serrata</i>	<i>Dinastyllodes biplicata</i>	<i>Lepidostylla macrura</i>
23. viii. 04.	9.30 p.m.	S.R. 143	112	112	50 miles W.N.W. of Blyne Head.	x	x		x	x		x		x				x	x
25. viii. 04.	12.26 a.m.	S.R. 159	220	220	31 miles W. by N. of Eagle Island.				x	x		x		x			x		
3. xi. 04.	3.0 p.m.	S.R. 165	244	244	40 miles W.N.W. of Tearaght Light-house.		x			x		x		x					
5. xi. 04.	7.30 a.m.	S.R. 171	337	337	43 miles W.N.W. of Tearaght Light-house.			x											
6. xi. 04.	2.0 p.m.	S.R. 172	454	454	54 miles W. by N. of Tearaght Light-house.														

There are also two additional specimens of *Iphinoë serrata*, ("10 miles W.N.W. of Tearaght, 75 fathoms, bottom townet, 9.25-9.55 p.m., 10:11:03," and "A. 24, 12:7:04, washed from sand of trawl, 20 fathoms, 2½ miles N.E. by E. of Straw I., Galway Bay,") and one additional male *Nannastacus brevicaudatus*, the record of which has been incorporated in Table II. above.

With regard to one of the shallow-water gatherings some data worth recording are sent me by Mr. W. M. Tattersall. Referring to a bottle labelled "A. 23a, Surface, 11:7:04," he says:—"It was a surface townet taken at night in Kilronan Harbour, Aran Islands, at the entrance to Galway Bay. The total number of Cumacea in the net was 440. The bottom townet taken at the same time [A. 23b] had 107 specimens." The bulk of these two gatherings consists of immature males and females of *Iphinoë trispinosa* and of adults and young of both sexes of *Pseudocuma longicornis*. A few males of *Vauntompsonia cristata* are present in both, and a few of both sexes of *Bodotria pulchella* in the surface gathering, while a single immature female of *B. scorpioides* is in that from the bottom.

One specimen is very remarkable on account of the circumstances under which it was captured. It is an adult male *Campylaspis sulcata*, G. O. Sars, and is labelled as having been taken from a *Verella* captured on the surface. The species has not been taken hitherto at a depth less than 120 fathoms, and the only record of any member of the genus having been taken at the surface is in the case of *C. pacifica*, taken by the "Challenger" at the Philippine Islands. I thought it advisable, therefore, to ask Mr. Stanley W. Kemp, who took the specimen, to give full details of the circumstances of its capture. He writes as follows:—

"While taking physical observations five miles W.S.W. of Achill Head, 10:8:04, a specimen of *Verella* was noticed floating alongside, and was caught in a hand-net made of mosquito-netting (small Cumacea would easily pass through this mesh). Before it was taken out of the net I remarked to Mr. G. P. Farran that there was a small crustacean on the dorsal surface of the *Verella*, which was accordingly transferred to a dish of sea-water. We were occupied taking temperatures for the next twenty minutes or so, and when again examined the only animal in the dish besides *Verella* was a small Cumacean. I cannot recollect whether it was alive or dead. There seems fairly strong evidence that the specimen was taken at the surface, but whether there is any connection between *Campylaspis* and *Verella* is quite another question."

I may add that the specimen shows no sign of having been dried up, as would certainly have been the case had it been a relic of a former catch adhering to the net or to the vessel containing the *Verella*.

The other gatherings from shallow water offer no novel features as compared with those recorded in the main part of the paper.

The following are particulars of the single unrecorded species:—

Diastylis tumida (Lilljeborg).

D. tumida, G. O. Sars, Crust. Norway, iii, p. 52, pl. xl, 1900.

Occurrence.—Two immature female specimens from 337 and 454 fathoms respectively (see table above).

Distribution.—Norway, north to Lofoten Is. (Sars), Scania (Lilljeborg), Kattegat (Meinert). "It is a true deep-water form, scarcely occurring in shallower water than 30 fathoms, whereas it descends to depths of more than 300 fathoms" (Sars).

DESCRIPTION OF PLATES—I-V.

PLATE I.

- Fig. 1. *Vauntompaonia cristata*, Spence Bate, ♂, second Leg.
 " 2. *Leucon siphonatus*, n. sp., young ♀.
 " 3. " " " " " anterior part of Head further enlarged.
 " 4. " " " " " Uropod.
 " 5. *Cumella gracillima*, n. sp., young ♀.
 " 6. " " " " ♂, Carapace.
 " 7. " " " " ♀ Antennule.
 " 8. " " " " ♀ Antenna.
 " 9. " " " " ♀ 3rd Maxilliped.
 " 10. " " " " ♀ 1st Leg.
 " 11. " " " " ♀ 2nd Leg.
 " 12. " " " " ♀ 5th Leg.
 " 13. " " " " ♀ Uropod.
 " 14. " " " " ♂ Uropod.
 " 15. *Nannastacus brevicaudatus*, n. sp., young ♀.
 " 16. " " " " ♀ fourth Leg.
 " 17. " " " " ♂ fourth Leg.
 " 18. " " " " ♀ Uropod.
 " 19. " " " " ♂ Uropod.

PLATE II.

- Fig. 20. *Cumellopeis Helgae*, n.g. and sp., young ♀, from the side.
 " 21. " " " " " anterior portion of Body from above.
 " 22. " " " " ♂, Antennule, Antenna, and upper Lip.
 " 23. " " " " ♂, Mandible.
 " 24. " " " " ♂, lower Lip.
 " 25. " " " " ♂, Maxillula.
 " 26. " " " " ♂, Maxilla.
 " 27. " " " " ♂, first Maxilliped with branchial apparatus.
 " 28. " " " " ♂ second Maxilliped.
 " 29. " " " " ♂ third Maxilliped.
 " 30. " " " " ♂ first Leg.
 " 31. " " " " ♂ second Leg.
 " 32. " " " " ♂ fourth Leg.
 " 33. " " " " ♂ fifth Leg.
 " 34. " " " " ♀ Uropod.
 " 35. *Campylaspis rostrata*, n.sp., young ♀ from side.
 " 36. " " " " " from above.
 " 37. " " " " " second Leg.
 " 38. " " " " " Uropod.

PLATE III.

- Fig. 39. *Platyekma Holti*, n.g. and sp., adult ♂, from the side.
 " 40. " " " " " from above.
 " 41. " " " " " dissection to show spiral coiling of Gut.
 " 42. " " " " " Antennule.
 " 43. " " " " " Antenna.
 " 44. " " " " " Mandible.
 " 45. " " " " " lower Lip.
 " 46. " " " " " Maxillula.
 " 47. " " " " " Maxilla.
 " 48. " " " " " first Maxilliped with branchial apparatus.
 " 49. " " " " " first Maxilliped further enlarged.
 " 50. " " " " " second Maxilliped from below.
 " 50A. " " " " " portion of same from above.
 " 51. " " " " " third Maxilliped.
 " 52. " " " " " first Leg.
 " 53. " " " " " second Leg.
 " 54. " " " " " fourth Leg.
 " 55. " " " " " fifth Leg.
 " 56. " " " " " Uropod.

PLATE IV.

Fig. 57. *Ceratocuma horrida*, n.g. and sp., adult ♂, from the side.

" 58.	"	"	"	"	from above.
" 59.	"	"	"	"	Antennule.
" 60.	"	"	"	"	Antenna.
" 61.	"	"	"	"	Mandible.
" 62.	"	"	"	"	tip of one lobe of lower Lip.
" 63.	"	"	"	"	Maxillula.
" 64.	"	"	"	"	Maxilla.
" 65.	"	"	"	"	first Maxilliped from below.
" 65A	"	"	"	"	part of same, from above.
" 66.	"	"	"	"	second Maxilliped.
" 67.	"	"	"	"	third Maxilliped.
" 68.	"	"	"	"	first Leg.
" 68A.	"	"	"	"	terminal part of same, further enlarged.
" 69.	"	"	"	"	second Leg.
" 70.	"	"	"	"	third Leg.
" 71.	"	"	"	"	fourth Leg.
" 72.	"	"	"	"	last Thoracic Somite viewed from in front to show papillae bearing crescentic genital orifices with median ventral spine between and in front of them.
" 73.	"	"	"	"	Pleopod of first pair.
" 74.	"	"	"	"	Pleopod of fifth pair.
" 75.	"	"	"	"	last Somite, Telson, and Uropod.
" 76.	"	"	"	"	last Somite, from a specimen in which the Telson was shut down over the anal orifice.
" 76A	"	"	"	"	the same, from another specimen with Telson elevated.

PLATE V.

Fig. 77. *Platyspis orbicularis*, n. sp., immature ♀, anterior portion of Body from above.

" 78.	"	"	"	"	anterior portion of Body from below.
" 79.	"	"	"	"	anterior portion of Body from the side.
" 80.	"	"	"	"	terminal part of Antennule.
" 81.	"	"	"	"	Antenna.
" 82.	<i>Diastylis tubificauda</i> , n. sp., young ♀ (?) from the side.				
" 83.	"	"	"	"	a portion of the lower edge of Carapace further enlarged.
" 84.	"	"	"	"	fourth Leg.
" 84A.	"	"	"	"	rudimentary Exopod of same, further enlarged.
" 85.	"	"	"	"	last two Somites, Telson, and Uropod.
" 86.	"	"	"	"	tip of Telson from the side.



Fig. 1. *Wormiprionia chalcidaria*. Fig. 2. *Leiden aphanta*. Figs 3-4. *Lumella gracilior*. Figs 5-9. *Nematus chalcidaria*. Figs 10-15. *Nematus chalcidaria*.



W. L. C. Helgei, 1910

Figs 20-34. *Camellopsis Helgei* Figs 35-38. *Campylaspis restricta*

A. S. P. L. 1910

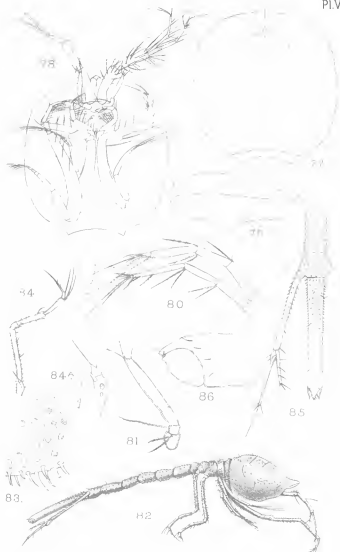


N. F. C. P. det. et.

1/2 scale 1/2 in long

Platycoma holsti





W T Calman, del ad nat.

A S Huth lith et imp

Figs. 77-81. *Platyaspis orbicularis*.

Figs. 82-86, *Diastylis tubulicauda*.

THE MARINE FAUNA OF THE COAST OF IRELAND.*

PART V.

ISOPODA

BY

W. M. TATTERSALL, B.Sc.

PLATES I. to XI.

INTRODUCTORY.

The word *Isopoda* is here used in its widest and most comprehensive sense to include, besides the more normal and true *Isopoda*, the somewhat anomalous order *Tanaidacea*. The latter have been included by most authors in the *Isopoda* proper as an aberrant tribe, and Sars, in his latest work on the group, regards them in this light, placing them in a separate tribe of *Isopoda*, to which he gives the name *Chelifera*. The arrangement which separates the *Tanaidacea* from the rest of the *Isopoda*, as a separate order of *Crustacea* *Malacostraca*, appears to be the most natural one, since the *Tanaidacea* diverge very markedly from the Isopodan type, and show in some of their characters a remarkable similarity to the higher crustacea. The most striking of these characters is the strongly built perfectly chelate structure of the first thoracic legs, a type of limb only met with elsewhere in the *Decapoda*. The *Apseudidae*, one of the families of the *Tanaidacea*, show further resemblance to the *Mysidae* and *Eucarida* generally in having two flagella to the superior antenna and a small antennal scale to the inferior antenna. I have, therefore, in this paper dealt with the *Tanaidae* and *Apseudidae* as a separate order, the *Tanaidacea*, of equal value to the *Isopoda*.

The material dealt with is derived from (1) the collections made at the Marine Laboratory of the Department when stationed at Ballynakill and Bofin, Co. Galway, between the years 1899 and 1904; and (2) the collections made by the Department's fishery cruiser, *Holga*, in deep water off the west coast of Ireland, and also on the east coast.

* This series has previously been entitled "Marine Fauna of the West Coast of Ireland." Since its inception, facilities for work on the East coast have been materially increased, and henceforth it will be convenient to deal with the fauna under the general groups without geographical sub-division.

The *Isopoda* as a whole are not pelagic organisms, and, therefore, are not liable to capture by townets. Certain species, however, are pelagic. These include *Gnathia maxillaris* (larvae only), the four species of *Eurydice*, *Munropsis Murrayi*, *M. oceanica*, and the larvae of *Epicarida*. Various species of *Idotea* are frequently captured by coarse townets towed rapidly at the surface, but it is their association with floating weeds rather than that they are truly free swimming which leads to their capture in this manner. By far the majority of *Isopoda* are bottom-living forms, and it is the dredged material and the contents of townets attached to the back of trawls and dredges which yield the larger number of species. The latter method of capture has proved remarkably efficient in the collecting of bottom-living forms. A tow net placed on the back of a trawl just where the swirl caused by the ground rope passes up through the meshes of the trawl net is sure to collect all the sediment and organisms thus stirred up. Occasionally the nets thus placed become full of sand, which on washing and sieving is nearly certain to yield new or rare species. One remarkable haul of this nature contained no fewer than twenty-one species of *Isopoda*, seven of them new to science, three new to the British and Irish fauna,* and the majority of the remainder very rare indeed.

By kind permission of Dr. G. H. Fowler I include a note on a remarkable Isopodan parasite of *Euphausia Mülleri* taken by him in the Bay of Biscay.

The paper is divided into five parts, the first containing descriptions of new genera and species, the second dealing with the Isopodan fauna of Ballynakill and Bofin Harbours, while the third enumerates those species taken in deep water on the Atlantic slope. Part four gives a list of species taken on the east coast, while a few remarks on the geographical distribution of the species dealt with are given at the end of the paper.

i.—DESCRIPTIONS OF NEW GENERA AND SPECIES.

Ten new species in all are described and figured below. Five of these have been referred to new genera, while one has been regarded as forming the type of a new family.

A preliminary description of seven of these new forms was presented to the British Association Meeting at Cambridge, in August, 1904. Since then three more new species have come

* In this paper, in order to avoid the confusion which has arisen from attempts to subdivide the marine fauna of the United Kingdom, the term "British and Irish" is used to denote the area defined by Norman as "British."

to hand, and descriptions and figures of all the ten are now offered. They may be enumerated as follows:—

- Typhlotanais proctagon*, sp. nov.
Bathycopea typhlops, gen. et sp. nov.
Metamunna typica, gen. et sp. nov.
Ischnosoma Greeni, sp. nov.
Munnopsis oceanica, sp. nov.
Munnopsoides Beddardi, gen. et sp. nov.
Ilyarachna Plunketti, sp. nov.
Eurycope longipes, sp. nov.
Lipomera lamellata, gen. et sp. nov.
Scyrrapeon tuberculosa, gen. et sp. nov.

The number of new forms is not surprising when one thinks how very little the undoubtedly rich ground, which lies to the west of our islands on the border of the Atlantic slope, has been explored.

In this part of the paper I give descriptions of the two sexes of two British species of *Cymodoce*. Though not new species, the sexually mature females were previously unknown, and descriptions of them can most conveniently be given here.

Terminology.—With the single exception of regarding the *Chelifera* as a separate order of equal rank to the *Isopoda*, the general arrangement and nomenclature followed in this paper are essentially those used by Sars in his work on the *Isopoda* of Norway. In this connection it is well to remember that the maxillipeds of *Isopoda*, though apparently appendages of the cephalon, are morphologically thoracic in origin, and should therefore be more properly described as the "first thoracic limbs." This title is given in the following paper to the second thoracic limbs in order to bring the terminology into line with that used by Sars, and also because in *Isopoda* and *Amphipoda* the first thoracic limbs proper or maxillipedes function more in connection with the true cephalic appendages than with those of the thorax.

ORDER TANAIIDACEA.

FAMILY TANAIIDAE.

GENUS *Typhlotanais*, G. O. Sars.

Typhlotanais proctagon, Tattersall.

T. proctagon, Tattersall, Report British Association, 1904.

Pl. I. Figs. 1-9.

Body (Fig. 1) linear, narrow but compact, about seven times as long as broad, of even width throughout.*

Cephalosome about one and a half to twice as long as the first free segment of the mesosome, comparatively robust, widest just posterior to the middle, rostrum very feebly developed.

Mesosome with the segments not narrowed posteriorly, but of even width throughout; first free segment smaller than the remaining five, which are subequal; first free segment with a very strongly acute forwardly directed spine on the ventral surface (Fig. 2); no trace of this spine on the succeeding segments.

Metasome equal to the last two segments of the mesosome combined, and about one quarter of the entire length of the body, first five segments subequal, last segment larger than the rest, and terminating in a somewhat acute process tipped by two small setae.

Superior antennae (Fig. 1) three-jointed; the first joint the longest, slightly longer than the remaining two combined, dilated somewhat at its base; second joint very short; third joint terminated by four or five long setae.

Inferior antennae (Fig. 9) shorter than the superior; second joint dilated, its outer corner produced acutely; fourth joint the longest; fifth slightly shorter than the fourth, terminating in a rudimentary one-jointed flagellum which is tipped by one very long seta longer than the terminal peduncular joint, and two shorter setae.

Mouth parts do not exhibit any salient points of difference from those of the type species of the genus, *T. tenuimana*.

Chelipeds or *first thoracic legs* (Fig. 3) moderately robust, with feeble hand about as long as the carpus, fingers shorter than the palm, appendage devoid of armature save for a few setae on the immovable finger of the hand.

Second thoracic legs (Fig. 4) slender, merus equal in length to the carpus, propodus longer than the carpus, nail very long and slender, equal in length to the propodus.

Third and fourth thoracic legs (Fig. 5) similar to the second except the nail, which is only about half as long as the propodus, merus and carpus provided with a small spine at their inner distal corners, that on the merus being stronger than the one on the carpus, propodus with a spine on the inner and one on the outer distal corners.

Fifth to seventh thoracic legs (Figs. 6, 7 and 8) with the basal joint markedly swollen; carpus, merus, and propodus with one or two spines on their inner distal corners, the latter joint with two spines on its outer distal corner; nail slightly shorter than the propodus, sometimes with secondary teeth; a very long seta on the outer distal corner of the propodus; inner edge of the merus and carpus finely crenulated, while these joints have also a ring of fine serrations on their inner distal corners. The spinulation differs somewhat in different specimens.

Pleopods of normal structure.

Uropods (Fig. 1) rather long, very nearly half the length of the metasome, biramous; the inner ramus biarticulate, the segments about equal in length, terminated by four long setae; outer ramus unarticulate, about one half the length of the inner ramus, tipped by one seta.

Length of adult female, 6 mm.

Male unknown.

Locality.—See p. 60.

This interesting species differs from all the Norwegian members of the genus in having a spine on the first free segment of the mesosome. The type of this section of the genus is *T. kerguelensis*, described from the *Challenger* collections by Beddard. The present species differs from *T. kerguelensis* in the much more feeble rostrum, and more robust cephalosome, in the shorter and stouter chelipeds, in the very markedly dilated base to the fifth, sixth, and seventh thoracic legs, and finally in size, *T. proctagon* being double the size of *T. kerguelensis*. In the latter species the chelipeds are remarkably long and slender, with a long and narrow carpus. The hand is shorter than the carpus, with two long and slender fingers. In *T. proctagon* the chelipeds, as described above, are much stouter and shorter, with the hand equal to the carpus. With regard to the basal joint of the fifth, sixth, and seventh legs, Beddard does not mention, in the description of *T. kerguelensis*, whether they are swollen or not. Judging from his figures they are only very slightly dilated, while the present species has them very much swollen. The swollen basal joint of the last three thoracic limbs is characteristic of the genus.

Dollfus has lately described three new species of *Typhlotana*, all of which bear spines on the ventrum of the first free thoracic segment, namely, *T. Richardi*, *T. spiniventris*, and *T. longimanus*. From *T. spiniventris*, this species is distinguished by the absence of spines from the second and following free segments of the mesosome, in the angular termination of the metasome, in the even width throughout of the segments of the mesosome, these latter in *T. spiniventris* being markedly narrower posteriorly, in the structure of the uropods and cephalosome and in the much more robust chelipeds. From *T. Richardi* it is chiefly distinguished by the structure of the cephalosome, the angular termination to the metasome, and by the character of the uropods. From *T. longimanus* the form of the chelipeds serves at once to readily distinguish it.

T. proctagon is one of the largest Tanaids, and is a most interesting addition to our fauna. Its nearest allies mentioned above are much deeper-water forms, only hitherto found to the west of the Azores.

ORDER ISOPODA.

TRIBE FLABELLIFERA.

FAMILY SPHAEROMIDAE.

The absence of this family from the fauna of Norway must be regarded as a great misfortune, since we are thereby deprived of the valuable help and unrivalled knowledge of Professor Sars, in the elucidation of a family whose present condition is one of absolute chaos. The sexual differences exhibited by the majority of species are the cause of this confusion. In many instances different stages of one sex have been described as separate species, while the two sexes often figure in different genera altogether. Both sexes of one species are in many cases not definitely known. Moreover, though almost endless species have been described, their mouth parts are only recently coming to be studied and receiving the attention they undoubtedly deserve.

The discovery by Dr. Hansen that the mouth parts of the females of the genus *Cymodoce* undergo considerable reduction during the breeding time in a similar manner to those of the Cymothoidae must completely revolutionise our knowledge of this genus, and inevitably lead to a reduction in the number of known species. Two species of this genus are recorded below, and their two sexes described. Dr. Norman, to whom I am very much indebted for valuable help with this difficult family, informs me by letter that he considers *Cymodoce truncata* and *C. emarginata* as different forms of the male, and *Sphaeroma curtum* and *S. prideauxianum* different forms of the female of one species, which must therefore bear the name *Cymodoce truncata*. Dr. Norman will deal with this in a paper shortly to be published. I also submitted to him specimens of the species recorded below as *C. granulatum* M.-Ed., and which I had thought to be *C. emarginata*. He very kindly told me that they were not *C. emarginata*, but were very close to *C. granulatum* M.-Ed., and sent me specimens of the latter, received from Prof. Heller under that name, for comparison. On examination of Dr. Norman's specimens and comparison with my own, I found that my examples agreed very well with *C. granulatum* M.-Ed., and I therefore record them provisionally under this name.

***Cymodoce truncata* (Montagu).**

Sphaeroma inerme, Tattersall, *loc. cit.*

Pl. II. Figs. 1-9.

Female (gravid).

General form of the body (Fig. 1) very much as in species of the genera *Sphaeroma* and *Dynamene*, short, oval in outline, compact, fringed all over by short fine hairs.

Cephalon, short, only equal in length to the first thoracic segment, evenly rounded in front.

First segment of the mesosome larger than any of the following, with the epimera well developed and expanded, both anteriorly and posteriorly.

Remaining segments of the mesosome decreasing in length posteriorly, epimera of all well developed.

First segment of the metasome faintly marked off from the rest, second and third segments partially separated, and fourth segment completely separated from the remainder of the pleon, fifth segment coalesced with the telson. In the specimens from which this description is taken and the figures drawn, the pleotelson was almost quite smooth. The most typical specimens have two more or less distinctly marked tubercles on the pleotelson.

Posterior border of the metasome with the centre produced into an obtuse point with a very faint notch on either side. Looked at from behind the produced point appears semi-tubular.

Eyes large, and laterally placed.

Antennae appear to be ventrally placed owing to the peculiar formation of the head, just as seen in *Sphaeroma*.

Superior antennae (Fig. 2) with the peduncle three-jointed, the first two joints broader and longer than the third, flagellum fifteen-jointed, the distal joints with few setae.

Inferior antennae (Fig. 3) with the peduncle four-jointed, the first three joints sub-equal, the fourth as long as the two preceding joints combined, flagellum fifteen-jointed, the first joint much the longest, the distal joints with few setae.

Mandibles (Fig. 4) broad and quadrangular, anterior end very bluntly rounded, without teeth, spines, or molar processes, palp three-jointed, the basal joint the longest and unarmed, the distal two joints carrying long plumose setae on their outer edges, the last joint terminated by a very long and strong plumose seta.

First maxillae (Fig. 5) consisting of two very blunt lobes, the inner one with three, and the outer one with a single very small spine at the tip; the whole appendage devoid of long setae, but having a general armature of very short and fine hairs.

Second maxillae (Fig. 6) consisting of three lobes, the inner with three very short spines at its tip, the outer two without spines; the whole appendage, like the first maxilla, devoid of long setae, but covered by a fringe of very fine short hairs.

Maxillipedes (Fig. 7) seven-jointed, basal joint short; second joint large and expanded, its inner edge with a fringe of fine short hairs, its outer edge carrying a broadly oval epig-nath, and armed with several long plumose setae; third joint very small; fourth joint long and somewhat expanded distally,

the inner distal corner with a single short spine; fifth joint shorter than the fourth, its inner border somewhat produced, with a single spine at the tip of the produced part; sixth joint longer than the fifth, not expanded, with a single spine at its inner distal corner; last joint short and narrow, with three setae at its tip; masticatory lobe conical in shape, its tip armed with two short spines and a longer plumose spine, with a masticatory process on its inner edge; whole limb, with the exception of the second joint, singularly devoid of the long setae so characteristic of these appendages in the male and female (not gravid).

First thoracic legs (Fig. 8) with the basal joint long and stout, the merus somewhat expanded, carpus small, propodus as long as the merus and carpus combined, dactylus shorter than the propodus, stout, bidentate at the tip; inner edge of merus, carpus and propodus respectively armed with four, three and three spines.

Remaining thoracic legs similar in structure to the first.

Pleopods of normal form.

Uropods (Fig. 9) reaching to the tip of the pleon, biramous, the outer ramus shorter than the inner, but owing to the mode of attachment of the appendage to the pleon it appears to be of equal length to the inner ramus. The latter with the tip truncate, the outer ramus with the tip more pointed, whole appendage armed with rather long setae.

Length, 9 mm.

Colour.—Preserved, the body is generally greyish, spotted all over with regular small black dots.

Immature females and adult females not gravid, differ from the gravid females in the mouth organs, which are not reduced, but agree in all points with those of the male described below.

Male.

The male form agrees essentially with the female form described above except in the following points:—

Body generally much more hirsute than in the female, especially as regards the metasome, and minutely granulated throughout.

Metasome strongly and rather coarsely tuberculated all over, the posterior border of the fourth segment drawn out a little on each side of the median line into a short pointed process, the border on the outside of this process strongly setose. The remainder of the metasome (pleotelson) has two low parallel carinae which lie directly behind and in line with the processes of the posterior border of the fourth segment. The carinae extend about half way down the pleotelson and end posteriorly in a very conspicuous tubercle. On the outer side of each carina is a row of strong setae. Behind the carinae, and in the median line, is a rather prominent tubercle with a smaller one on each side of it, all three tubercles densely setose. The

posterior border of the pleotelson is tridentate, the teeth very prominent and tuberculate, and the clefts moderately deep. The median tooth is abruptly truncate at its tip, the lateral teeth being more pointed.

Uropods very densely setose, the outer one with its outer edge very greatly thickened by a very prominent ridge, so that it is incapable of being completely closed under the inner one.

Mandibles very much more complicated than in the gravid female, cutting edge divided into two parts, each portion strongly toothed, molar process well developed and very prominent; palp three jointed, somewhat shorter than in the female, the last two joints somewhat expanded and setose on their inner margin.

First maxillae very different from the same parts of the gravid female, and much more normal in structure, consisting of two lobes, the outer armed with about ten very strong chitinous spines, the inner one bearing at its tip four long plumose spines and a short simple spine.

Second maxillae likewise profoundly different from those of the gravid female, consisting of three lobes, each lobe armed with several strong and plumose spines.

Maxillipedes with the fourth, fifth, and sixth joints produced into lobes, all armed at the tip with numerous fairly long setae, masticatory lobe strongly armed at its tip with plumose spines, two plumose spines also on the inner edge internal to the single masticatory hook.

Thoracic legs exactly as in the female, except that in the specimen examined in detail the merus, carpus and propodus bore five, three and four short spines respectively.

In a male specimen of this species kindly sent to me by Rev. Canon Norman, the two carinae on the pleotelson were very much more prominent and ended posteriorly in a strongly raised ridge, which in lateral view was triangular in shape. The lower outer corners of both uropods were also produced into a very acute process resembling a spine. In most of my specimens this process was absent.

The gravid female of this species has up till now remained quite unknown. On first examining and dissecting it I thought it represented an entirely new type of *Sphaeromid*, and provisionally gave it the name of *Sphaeroma inerme* in the paper presented to the last meeting of the British Association, though at the same time I had strong suspicions as to its true identity, since it was found in company with one or other species of *Cymodoce* each time the latter was taken. The profound differences which exist in the mouth parts of the two sexes, however, decided me to regard my type as new. Dr. Hansen very kindly put me right in this matter, and informed me that the species which I called *S. inerme* was in reality only the gravid female of the species of *Cymodoce* with which it was found, thus confirming the suspicions which I

had regarding its true identity. Gourret had likewise been misled in the same way, his two species, *Dynamene corallina* and *Dynamene setosa*, being in reality only female forms of *Cymodoce*, as will be seen from an examination of his figures of the mouth parts, which agree, as far as they go, with those here figured for the female of *Cymodoce truncata*.

Locality and distribution, see p. 47.

***Cymodoce granulatum*, M.-Ed.**

This species is so closely allied to *C. truncata* that it will suffice if the differences noted between the two are enumerated.

Female (gravid).

The gravid female *C. granulatum* differs from the same sex in *C. truncata*—(1) in the presence of two very faint parallel carinae on the pleotelson, (2) in having the ante-penultimate joint of the maxillipedes much less produced, and the masticatory lobes much narrower and of equal width throughout, whereas in *C. truncata* they are broader and somewhat conical in shape at the anterior end; (3) in having the outer branch of the uropods proportionally narrower and much less truncate at the tip.

Male.

The male differs chiefly from the male of *C. truncata* in the form of the metasome.

The metasome of the male of *C. granulatum* is, like that in *C. truncata*, somewhat coarsely granulated all over, but is not anything like so densely setose. The fourth segment is produced a little on each side of the middle line into a short acute process. On the pleotelson immediately behind the two processes of the fourth segment are two somewhat diverging sharp carinae much more distinct and raised than in *C. truncata*. They do not terminate in a tubercle, but are more elevated at their extremity than at any other point in their length. They extend about half-way down the pleotelson. Somewhat posterior to the carinae and in the median line is a small, smooth linguiform process which projects almost at right angles to the surface, and has on each side of it a low granulated tubercle, while a very slight carina likewise proceeds from each side of it outwards and forwards to the posterior end of the two large carinae. The posterior border is tridentate as in *C. truncata*, but the median tooth is not truncate but broadly rounded. The setae are almost absent, a few only fringing the posterior border of the fourth segment and the terminal border of the pleotelson. There are signs of two obtuse tubercles on the combined second and third segment of the metasome. The general body is also minutely tuberculated throughout.

Uropods with the ridge on the outer side of the external ramus very much less pronounced than on *C. truncata*, and the setae considerably fewer.

Locality and distribution, see p. 64.

FAMILY ANCINIIDAE nov.

Body broadly oval in shape, and exceedingly depressed; capable of being doubled up on itself, so that the metasome becomes opposed to the ventral surface of the cephalon; without armature save for a few scattered setae on the sides of the mesosome.

Cephalon small, distinct from the mesosome.

Mesosome with all the segments distinct and sub-equal in size, epimera broad and very distinct, so that the body is divided into three divisions, a broader central one and two narrower lateral ones, as in the *Serolidae*.

Metasome with the first two segments distinct, the first having well defined epimera; the remaining four segments fused into a large triangular plate.

Eyes, when present, placed on the dorsal surface of the cephalon and not laterally.

Antennae sub-equal, the superior pair being if anything slightly longer than the inferior ones.

Mandibles moderately strong, with a well developed three-jointed palp.

Maxillae small and delicate.

Maxillipedes small, covering entirely the maxillae.

First thoracic legs of both sexes large, subcheliform, propodus much expanded, dactylus long and strongly curved.

Second thoracic leg of the male similar to that of the first, but much smaller. That of the female simple and slender.

Third to seventh thoracic legs of both sexes simple and somewhat slender in form.

Pleopods foliaceous, partly natatory, partly branchial.

Uropods extremely large and uniramous, consisting of a short stout basal joint and a long curved scythe-like terminal joint.

The type genus of the family is *Ancinus*, M.-Ed., founded for the reception of the remarkable *Naesa depressa* of Leach.

This definition of the family is founded entirely upon the examination of the new generic type described below. I believe *Ancinus* to belong to the same family, and as the earliest known genus it must give the family its name. The new genus below is only provisionally kept distinct from *Ancinus* till the type of the latter has been minutely examined. When this is done it may be found that *Bathycopea* is generically the same, and the name will therefore lapse.

GENUS **Bathycopea**, Tattersall.*Bathycopea*, Tattersall, *loc. cit.*

Having the characters of the family given above and differing, as far as can be seen in the absence of a detailed examination of the type, from the only other genus in the family, *Ancinus*, in the total absence of eyes.

Bathycopea typhlops, Tattersall.*Bathycopea typhlops*, Tattersall, *loc. cit.*

Pl. III. Figs. 1-13.

Body (Fig. 1) broadly oval in shape, very flattened, capable of being doubled up on itself so that the metasome lies against the ventral surface of the cephalon.

Cephalon small, distinct from the mesosome, though the suture becomes rather faint towards the middle of the body, front produced into a short but very acutely pointed rostrum, the cephalon on each side of the rostrum somewhat hollowed out for the reception of the basal joints of the antennae.

Mesosome composed of seven sub-equal segments, the first two of which are, if anything, slightly larger than the remaining ones; epimeral plates well marked, each being produced on its anterior edge, just at the junction with the main segment, into a short blunt process which underlies the preceding epimeral plate, and is thus not visible in a dorsal view (Fig. 13); these processes become double in the posterior segments; armature consisting merely of a few short scattered setae on the lateral edges of the epimeral plates.

The well-marked and broad epimera give the appearance to the body of being divided into three parts, a broad median and two narrower lateral parts, recalling the general form of the *Serolidæ*. This character has been regarded by some authors as indicating for the latter family an affinity with the now extinct Trilobites.

Metasome with the two anterior segments free, the first provided with well marked epimera, which do not, however, possess processes on their anterior edges similar to those of the epimera of the mesosome. Last four segments united into a large and massive triangular plate which tapers gradually to a point and has not the apex truncate as in *Ancinus depressus*.

Eyes entirely absent.

Superior antennae (Fig. 2) slightly longer than the inferior ones, with a peduncle of four and a flagellum of seven joints; basal joint of the flagellum rather stout, almost as broad as long, slightly longer than the next joint; the second

joint narrower and shorter than the first; the third joint much narrower than either of the preceding ones, and as long as those two combined; last joint exceedingly small; flagellum with the first joint longer than any of the succeeding ones; the whole appendage very sparsely provided with setae, one or two of the peculiar sensory cylindrical setae being present on the terminal joints.

Inferior antennae (Fig. 3) with a peduncle of five joints and a flagellum of five joints; the first joint of the peduncle small and fairly stout; the second as stout as the first but considerably longer; the third shorter than the second; the fourth as long as the second but not so stout; the fifth the smallest of all; the whole appendage sparingly armed with setae, none of which are sensory.

Labrum produced somewhat acutely into a process underlying the rostrum.

Mandibles (Fig. 4) of a type very similar to that seen in the *Serolidae*; the palp is three-jointed, the middle joint being the longest; the terminal joint is oval in shape and armed on one margin only with long hairs, of which the terminal one is longer and stronger than the rest; the distal part of one margin of the middle joint of the palp is likewise armed with long hairs, but the rest of the appendage is devoid of them; the basal portion of the mandible has the terminal half set at an angle to the basal half, the two parts rather markedly separated; the cutting edge is provided with three blunt teeth; in addition the mandible is also provided below the cutting edge with a chisel-like process and a spine serrated distally on one edge. The chisel-like process has the tip imperfectly formed into two blunt teeth. Similar processes and spines are noted by Beddard in the *Serolidae*. The chisel-shaped process is absent from the right mandible, a condition again met with in the *Serolidae*.

First maxillae (Fig. 5) very delicate, consisting of a large basal joint from which springs a large somewhat curved lobe furnished at its extremity with strong spiniform setae. At the base of this lobe, but springing directly from the basal portion of the maxilla, is a small straight blunt lobe, armed at its tip with one long and three short setae.

Second maxillae (Fig. 6) rather smaller than the first, consisting of three lobes armed at their tips with long setae.

Maxillipedes (Fig. 7) rather small, meeting in the middle line and entirely covering the maxillae, composed of the usual seven joints, of which the second is large and rectangular, and to which the remaining five are articulated as a palp; the third joint extremely small; the fourth and fifth, larger and longer than the two terminal ones, and each armed with one long and one short seta; the sixth joint has a similar armature,

while the seventh bears one long and two or three short setae. The second expanded joint is uniformly fringed with short hairs, and bears on its inner edge a single blunt sensory process.

First thoracic legs of both sexes (Fig. 8) large, subchelate, strongly built, the merus and carpus rather small and narrow, the latter having the distal corner somewhat acutely pointed and tipped by a few setae; propodus very much swollen and expanded, with the inner edge very coarsely toothed, and bearing a row of setae, one seta between each tooth; dactylus strongly recurved and suddenly narrowed at the extremity, bearing two conspicuous teeth on its inside edge near its articulation with the propodus.

Second thoracic legs in the male (Fig. 9) subchelate, smaller than the first, with the propodus not nearly so much expanded, unarmed along the inner edge save with a few setae, dactylus strongly recurved, blunt, not as long as on the first leg, without teeth on its inner edge.

Second thoracic legs in the female (Fig. 10) simple, somewhat slender, carpus equal in length to the propodus, dactylus shorter than the propodus, sharply pointed; very few setae present on limb.

The remaining thoracic limbs (Fig. 11) of both sexes are constructed on the same plan as the second thoracic leg of the female, though somewhat longer than the latter limb.

First pleopods consisting of a basal joint and two oval lamellae, the outer one shorter than the inner one, both setose all round the edges.

Second pleopods with the inner lamella slightly longer than the outer, trapezoidal in shape, with the outer edge very finely serrate, the distal edge alone bearing setae; outer lamella oval, with setae all round. The inner lamella in the male (Fig. 12) bears on its inner edge a long very finely pointed stylet as long as the lamella itself.

Third pleopods with the inner lamella oval in shape and slightly longer than the outer, with a very few setae at its distal extremity; the outer lamella with setae all round.

Fourth pleopods with the lamellae sub-equal, devoid of setae with the exception of a single strong bristle at the distal extremity of the inner lamella.

Fifth pleopods with the outer lamella longer than the inner one, both devoid of setae.

Uropods (Fig. 1) very large and massive, with a short and stout basal joint articulating with the proximal part of the metasome and projecting almost straight out at right angles to the longitudinal axis of the body; terminal joint large and scythe-shaped, curving strongly inwards and approximating

to its fellow of the other side; a short blunt tooth on the inner edge near the tip; the whole appendage armed with a few scattered setae. Under the high power of the microscope both edges seem to be regularly toothed along their full length.

Length of adult male and female, 5 mm.

Locality, see p. 65.

The little creature is extremely hardy, and was noticed to be alive and very active after coming up from so great a depth as 320 fathoms. The integument is extremely hard and brittle.

I am conscious that this species may not really be generically distinct from *Ancinus depressus* (Leach). The latter is only known to me from the brief descriptions and figures given by Milne-Edwards (*Histoire des Crustacés*, Vol. III.). I have not had the opportunity of examining the type specimen in the British Museum. From Milne-Edwards' figures, the present form is certainly most closely allied to *Ancinus depressus*, but is at least specifically distinct in differing, as it does, in the absence of eyes, and in the metasome not being truncate at its extremity.

Affinities.—It is obvious that the definition of no existing family of *Isopoda* will permit of the reception of this remarkable form within its limits. Hence it is necessary to form a new family to include it and *Ancinus*, the family taking its name from the latter genus and being co-extensive with the "*Spheromiens chelifers*" of Milne-Edwards. The *Ancinidae* are most clearly related, on the one hand, to the *Sphaeromidae*, and on the other, to the *Serolidae*, occupying a position intermediate between the two. Indeed, the generic name *Bathycopoea*, which I have applied to the above form, was suggested by its close external resemblance to the Sphaeromid genus *Campecopea*.

The characters in which it agrees with the *Sphaeromidae* are:—

- (1.) The separation of the cephalon from the first segment of the mesosome.
- (2.) The large size and prominence of the metasome.
- (3.) The large scythe-like uniramous uropoda in which it approaches *Campecopea*.

With regard to the first character given above it may be remarked that the maxillipedes of *Isopoda* generally, though apparently belonging to the head, are clearly of thoracic origin, and the so-called cephalon of *Isopoda* is therefore really a cephalothorax. For convenience of description, and in order to bring the nomenclature into line with G. O. Sars' "*Crustacea of Norway*," I have referred to it as the cephalon simply. In all *Isopoda* save the *Chelifera* and the *Serolidae* the cephalon is distinct from the first segment of the mesosome.

In these latter two families it is united with the first segment of the mesosome. In the *Anciniidae* there is a tendency to such a union, the suture between the cephalon and first segment of the mesosome becoming indistinct towards the centre of the body. The large size of the metasome in the *Anciniidae* is in great contrast to that of the *Serolidae*, in which it is small and partially surrounded by the great development of the epimera. The large scythe-like uropods are exactly like those seen in *Campecopea*, and differ markedly from the small biramous uropoda of the *Serolidae*.

The relations of the present family to the *Serolidae* are of a much closer nature, the points of resemblance being both numerous and of great moment. They may be enumerated as follows:—

- (1.) The remarkably flattened and broadly oval shape of the body.
- (2.) The development of the epimera in both families is such as to divide the body into three distinct portions.
- (3.) The presence of a small but acutely pointed rostrum.
- (4.) Eyes, when present, placed on the top of the cephalon and not laterally.
- (5.) The general form and structure of the mouth parts.
- (6.) The remarkable modification of the first thoracic leg in both sexes, and the structure of the second thoracic leg in the male.

The development of the epimera on the *Anciniidae* is not so striking as in the *Serolidae*. In the latter family they are often prolonged enormously into spiniform processes, which curve backwards so as to almost enclose the metasome, cf. *S. bromleyana* and *S. neaera*. In others they are not so greatly developed, but as a rule are broader than in the *Anciniidae*, and the anterior ones are larger than the posterior, so that the body as a whole is wider in front than behind. The epimera of the *Anciniidae* are of about equal size throughout the mesosome, with the exception of those of the first two segments, which, though deeper than the succeeding ones, are not laterally expanded. The dorsal position of the eyes in the two families is a character in which they differ very conspicuously from all other Isopoda, in which they are laterally placed.

The structure of the mouth parts, with the exception of the maxillipedes, is remarkably similar in the two families. Particularly is this so with the mandibles. Beddard, in his monograph of the genus *Serolis*, has shown that the mandible bears, in addition to the usual cutting edge, two accessory processes, one a chisel-like cutting blade, and the other a spiniform process with a serrated edge. Moreover, the former process is

absent or replaced by a spine in the right mandible. Precisely similar processes are found in the mandible of *Bathycopca typhlops*, and here also the ebisel-shaped process would appear to be absent from the mandible of the right side.

The first maxillae are likewise constructed on the same lines in both families. They consist, in *B. typhlops*, as described above, of a basal portion and a large terminal lobe tipped with strong spiniform setae. From the basal portion, at the base of the terminal lobe, there springs a small accessory lobe. The presence of this accessory lobe in the first maxillae of the *Serolidae* was first noticed by Audouin and Milne-Edwards. Its existence was later denied by Grube, but Beddard found it present in most, though not all, of the species of *Serolis* which he examined. In no other Isopoda are the first maxillae so constructed. The small secondary lobe is no doubt the remains of the large inner lobe of the first maxillae of most Isopoda.

The maxillipedes in the two families differ rather considerably from one another. In the *Anciniidae* they are of the more normal type found in the *Sphaeromidae*. Those of the *Serolidae* are described by Beddard as consisting of a basal part, broadly expanded and divided into four, and a three-jointed palp.

The remarkable modification of the first thoracic leg in both sexes and the further modification of the second thoracic leg in the male only are of exactly similar nature in both families, and are points which indicate the closest affinity between the two. In no other Isopoda is such a striking form of thoracic leg met with, except, possibly, in *Tecticeps*, and the two families are thus sharply defined in this respect from all others of the order. Dana suggested that *Ancinus*, by reason of the sub-cheliform condition of the first thoracic legs, was nearly related to the *Tanaidae*. He had seen no specimens, however, and from the above description of a closely allied form it will be seen that such a suggestion cannot for a moment be entertained. Richardson has lately described, from North America, a remarkable new genus *Tecticeps*, which has a very much flattened body, eyes present on top of the head, and small biramous uropoda. The first and second thoracic legs are, moreover, described as having the propodus "dilated with reflexed dactylus." They therefore agree with the same limbs in the male of both *Serolis* and *Bathycopca*, and the genus appears very closely related to the former. It has been suggested that the *Serolidae*, by reason of the flattened condition of the body and its apparent division into three longitudinal parts in consequence of the great development of the epimera, show affinities with the fossil *Trilobita*. I am not prepared to make a similar suggestion with regard to the present family, nor do I think its discovery throws any new light on this much disputed point.

To sum up, therefore, the *Anciniidae* are intermediate in character between the *Sphaeromidae* and the *Serolidae*, with, perhaps, a rather closer relationship to the latter. With regard to the possible phylogeny of the group it would be premature, in the absence of knowledge of their ontogeny, to put forward any opinion, but it seems probable that both the *Anciniidae* and *Serolidae* are parallel offshoots from some primitive Sphaeromid stock.

TRIBE ASELLOTA.

FAMILY MUNNIDAE.

GENUS *Metamunna*, Tattersall.

Metamunna, Tattersall, *loc. cit.*

Very closely allied to the genera *Pleurogonium* and *Paramunna*, differing from the former in the presence of well-marked ocular processes and eyes, and from the latter in the absence of the two diverging lobes from the cephalon and in the general shape of the body.

The specimen on which this new genus is founded might well have been referred to the genus *Pleurogonium* G. O. Sars, were it not for the fact that Sars defines that genus as having the eyes wholly absent. Rather than interfere with the existing definition of genera, I have preferred to found a new genus for the reception of the form described below.

Metamunna typica, Tattersall.

Metamunna typica, Tattersall, *loc. cit.*

Pl. IX., Figs. 1-3.

Body (Fig. 1) shaped almost exactly as in the genus *Pleurogonium*, about twice as long as broad.

Cephalon roughly quadrangular, front almost straight and entirely wanting the two lobes seen in *Paramunna*; sides produced into well marked narrow ocular processes with well developed eyes at their tips.

Mesosome with the first four segments broader than the last three and well marked off from the latter, lateral parts angular and unarmed; three posterior segments with the lateral parts slightly recurved.

Caudal segment or *metasome* narrower than the rest of the body, rather less than half of the total length of the animal, constricted at the base, terminal part produced into an obtusely pointed tip, sides serrated with about twelve small teeth.

Superior antennae (Fig. 1) projecting laterally from the cephalon just above the ocular lobes, peduncle three-jointed; first joint longer than the remaining two combined; third joint small, flagellum shorter than the peduncle, triarticulate; last joint with a long apical filament.

Inferior antennae (Fig. 1) longer than the superior antenna, peduncle six-jointed; first two joints small; the third the longest, with its inner distal corner produced into an acute process forming a distinct knee, from which the remaining part of the appendage projects laterally almost at right angles; fourth joint small; sixth rather shorter than fifth; flagellum five-jointed, shorter than the peduncle.

Mouth parts.—Only a single specimen of this new form having been taken the mouth parts were not dissected out. They will be found, I believe, to correspond substantially with those of *Pleurogonium*.

First thoracic legs (Fig. 2) shorter and more robust than the remainder, carpus longer and stouter than the merus, bearing three stout spines; propodus as long as the carpus; dactylus rather long and strongly recurved with a secondary tooth on the inside edge.

Remaining thoracic legs very much as in *Pleurogonium*.

Uropods (Fig. 3) short, proceeding from the sides of the metasome immediately behind the serrated part of the lateral edges, and some considerable way from the tip; biramous, inner ramus exceedingly small, only about half as long as the outer, armed at tip with two long setae, outer ramus with four long setae at the tip.

Length of female, 2 mm.

Male unknown.

Locality, see p. 71.

This new form is more closely related to the genus *Pleurogonium* than to the genus *Paramunna*. The general shape of the body, the pointed extremity of the metasome, the longer peduncle to the superior antenna, and the unigenuiculate inferior antenna, are points in which it agrees exactly with *Pleurogonium* and differs from *Paramunna*. It agrees with the latter genus in the presence of well-marked, though small, ocular lobes and eyes, which in *Pleurogonium* are entirely absent. It is to be regretted that the scarcity of examples would not allow of the dissection of the mouth parts, but I did not think the dissection of the only known specimen justifiable. *Paramunna* differs from *Pleurogonium* in possessing palps to the mandibles, and it would have been interesting to have seen whether the close outward resemblance of this new form to *Pleurogonium* extended to the mouth parts also.

FAMILY DESMOSOMIDAE.

GENUS *Ischnosoma*, G. O. Sars.*Ischnosoma Greeni*, Tattersall.*I. Greeni*, Tattersall, *loc. cit.*

Pl. IV., Figs. 1-6.

Body (Fig. 1) sublinear in shape, about six times as long as broad in its widest part, much stouter in build comparatively than the type species of the genus, *I. bispinosum*, agreeing more in this respect with *I. quadrispinosum*, the body and appendages closely covered by coarse spinulose tubercles, but except on the first segment of the mesosome entirely devoid of large and prominent spines.

Cephalon small, quadrangular, front evenly rounded.

Mesosome with the first segment deeply emarginate anteriorly for the reception of the cephalon, its lateral parts bearing a short strong blunt spine beset by small spinules like the rest of the body; second and third segments of equal size, lateral parts unarmed; fourth and fifth segments together about two-fifths of the total length of the body, forming an hour-glass-shaped portion, which gives the characteristic shape to the body; sixth and seventh segments small, lateral parts unarmed.

Metasome (Fig. 6) with the first segment free from the abdominal shield, the latter rather less than one-fifth of the total length, posterior border evenly rounded.

Superior antennae (Fig. 2) of remarkable form, peduncle only two-jointed; first joint short and swollen; second joint nearly twice as long as the first, and near its distal extremity bearing three very long setae, flagellum exceedingly minute, three-jointed; the last joint very small.

Inferior antennae (Fig. 1) very long; first joint very small; second joint long and stout, bearing on its inner proximal edge a two-jointed blunt spine; third joint short; fourth joint long and narrow, slightly shorter than the fifth; flagellum as long as the last three joints of the peduncle and composed of eighteen to twenty joints.

Mouth organs exactly as found in *I. bispinosum*.

First thoracic legs (Fig. 3) shorter and much stouter than the rest; carpus as long as the two preceding joints combined, greatly inflated, armed with two long and two short spines as well as setae; propodus shorter than carpus, somewhat expanded, armed with three slender spines and one or two long setae; dactylus as long as the propodus, armed at its tip with setae.

Second thoracic legs (Fig. 4) with the carpus long and linear, longer than the propodus, dactylus slightly shorter than the propodus.

Third to seventh thoracic limbs (Fig. 5) very similar to the second, slightly longer, and with the propodus proportionally longer, so that it is almost as long as the carpus, carpus and propodus armed with few short spines.

Uropods (Fig. 6) nearly one-half the length of the metasome excluding the first free segment, consisting of a single stout pointed joint, armed with a few setae in addition to the spinules which cover the rest of the body.

Colour in spirit light; one specimen is, however, a dark green colour.

Length, 4 mm.

Locality, see p. 72.

The species is named in compliment to the Chief Inspector of Fisheries of the Department of Agriculture and Technical Instruction for Ireland. Including *I. Greeni*, seven species of *Ischnosoma* are now known, *I. bispinosum*, the type, *I. quadrispinosum*, described by Sars from the Norwegian North Atlantic Expedition, *I. spinosum*, *I. bacillus*, *I. bacilloides* and *I. Thomsoni*, described by Beddard from the collections of the *Challenger*.

From *I. bispinosum*, *I. bacillus* and *I. bacilloides*, *I. Greeni* is at once distinguished by the spinulose general armature of the body, by the uniarticulate character of the uropoda, by the greatly elongated second joint of the inferior antenna, and by the structure of the superior antenna.

From *I. quadrispinosum*, which *I. Greeni* approaches very closely, and which has the body beset with small spinules like *I. Greeni*, the latter is distinguished by the absence of spines from the third segment of the mesosome, by the structure of the superior antenna, and by the greater comparative length of the uropods.

From *I. spinosum*, *I. Greeni* can be distinguished by the absence of large spines from the segments of the mesosome as well as the cephalon, and by the somewhat stouter build of the body. Otherwise the two species are very nearly related, and the remarkable structure of the superior antenna is the same in both.

From *I. Thomsoni*, *I. Greeni* differs in having the first mesosome segment deeply emarginate for the reception of the cephalon, in the absence of large spines from the body, the comparative length of the uropods, and the shorter nail to the thoracic legs.

I had at first thought that *I. spinosum* and *I. Greeni*, and possibly *I. Thomsoni*, might be regarded as generically distinct from the other species of the genus by reason of the structure of the two antennae, the uniarticulate character of the uropods, and the separation of the first segment of the metasome from the remainder of the caudal segment, as well as by the general armature of the body. *I. quadrispinosum*, however, would seem to form a link between the two groups of the genus, agreeing with the type *I. bispinosum* in the structure of the superior antenna and the fusion of the first segment of the metasome with the remainder of the caudal segment, and on the other hand agreeing with the *I. spinosum* group in the armature of the body, structure of the inferior antenna and character of the uropoda. Moreover, the structure of the mouth organs would seem to be identical in all the species. It therefore seems best, at present, to include all the species in the one genus *Ischnosoma*.

The following table may be useful in determining the known species of the genus :—

GENUS *Ischnosoma*, G. O. Sars

A.—Body smooth, second joint of inferior antenna small and subequal to the first and third; uropods biarticulate.

- (i.) Spines absent except on the first segment of the mesosome, which has a single spine on each lateral part.

I. bispinosum.

I. bacillus and *I. bacilloides* are only known from fragments, but have the fourth and fifth segments of the mesosome exceedingly slender and armed with long spines. The uropods are biarticulate.

B.—Body covered with small spinules, second joint of the inferior antenna elongate, uropods uniarticulate.

- (i.) Peduncle of superior antenna two-jointed, flagellum very small.

(a.) Spines on the lateral parts of the first three segments of the mesosome and on the dorsal surface generally.

I. spinosum.

(b.) Spines absent except a single one on the lateral parts of the first segment of the mesosome.

I. Greeni.

- (ii.) Peduncle of superior antenna three-jointed, flagellum almost as long as peduncle.

I. quadrispinosum.

I. Thomsoni would belong to group B above, but its antennae are unknown. It may, however, be distinguished by the exceedingly short uropods, which do not project beyond the tip of the caudal segment, and by the short rod-like spines on the segments of the mesosome.

FAMILY MUNNOPSIDAE.

GENUS *Munnopsis*, M. Sars.*Munnopsis oceanica*, sp. n.

Pl. V., Figs. 1-7.

Body (Fig. 1) compact, more so than in *M. typica*, anterior division but little wider than the posterior, about three times as long as broad.

Cephalon small, deeply emarginate on each side for the reception of the antennae, front very slightly emarginate.

Mesosome with the first four segments small and compact, lateral parts unarmed, epimera very small; last three segments of the mesosome, combined, as long as the anterior division of the body; the fifth somewhat overlapping the preceding segment of the mesosome, its lateral parts narrow and extending for some way posteriorly, armed with a few strong setae; the lateral parts of the sixth segment somewhat produced posteriorly, and also armed with a few setae.

Caudal segment about one-third of the length of the body, and equal in length to the last three segments of the mesosome combined, regularly oval in form, tip obtusely produced.

Superior antennae (Fig. 2) with the basal joint somewhat expanded, inner corner produced but slightly, flagellum very long and composed of numerous articulations, each bearing long fine setae, the setae more numerous towards the distal end.

Inferior antennae, with the exception of the three basal joints, which are normal, wanting.

Mandibles (Fig. 3) with the cutting edge divided into two parts, each part strongly dentate; below the cutting edge is a small prominence bearing several strong spiniform setae serrate on one edge; below this lobe again, and in a position corresponding to the molar expansion of other Munnopsids, is a very strong spine, slightly serrate on one edge. Palp well developed, three-jointed; last joint somewhat expanded, and setose on one edge.

Maxillae of normal structure, but with scattered setae over the general body of them in addition to those at the tips of the lobes.

Maxillipedes (Fig. 4) with the antepenultimate joint expanded and rounded instead of pointed as in *M. typica*, bearing a few setae; penultimate joint very acutely and strongly produced on its inner edge into a lobe tipped with setae, masticatory lobe with four sensory processes on its inner edge, tip fringed with setae. There is a slight lobe on the lower edge of the masticatory part, as seen in *M. Murrayi*. Epignath acutely pointed.

First thoracic legs (Fig. 5) moderately slender, carpus broader and longer than the propodus, which is rather narrow, dactylus very short. Compared with the same limb in *M. typica*, the propodus and carpus are relatively longer and the ischium shorter.

The three succeeding pairs of legs are all wanting in the single specimen captured.

Natatory legs (Fig. 6) with the carpus large and expanded on one edge, the other edge being but slightly curved, propodus about half as long as the carpus, and oval in outline; both propodus and carpus fringed with very long plumose setae, dactylus wanting.

Pleopods normal, male operculum as in *M. typica*.

Uropods (Fig. 7) long and slender, about one-quarter the total length of the body, two-jointed, the first joint small, with a prominent spine on its inner distal corner; terminal joint from three to three and a half times as long as the basal joint.

* *Length*, 7 mm.

Female unknown.

Locality, see p. 72.

If the definition of the genus *Munnopsis*, given by Sars in his Crustacea of Norway, be strictly adhered to, the present species, as well as *M. longicornis*, Hansen, and *M. Murrayi*, Walker, could not be included in that genus. In the definition above referred to the mandibles are described as "without molar expansion, cutting edge but slightly dentated," and the natatory legs are defined as being without a dactylus. All the above three species differ from this generic definition in the characters of the mandibles. *M. longicornis* and *M. oceanica* have a strongly toothed cutting edge to the mandibles, but the molar process is replaced by a strong spine, as described above. *M. Murrayi* has a strongly dentate cutting edge, and a well developed broad molar expansion to the mandibles, and differs further in having a well-marked dactylus on the natatory legs. All three species have a prominent lobe bearing strong setae below the cutting edge.

The characters of the four species with respect to the mandibles and natatory legs may be summed up as follows:—

- (i.) Mandible with cutting edge slightly dentate, no setose lobe, no molar expansion; natatory legs without dactylus.

M. typica.

- (ii.) Mandible with cutting edge strongly dentate, setose lobe present, molar process replaced by a serrated spine, natatory legs without dactylus.

M. oceanica.

M. longicornis.

- (iii.) Mandibles with cutting edge strongly dentate, setose lobe and broad molar expansion present, natatory legs with a distinct dactylus.

M. Murrayi.

We must either regard each of these three groups as representing distinct though closely allied genera, or include them all under the one genus—*Munnopsis* enlarging Sars' definition of that genus with respect to the mandibles and natatory legs in order to embrace them all. In the present state of our knowledge of the group I prefer the latter course, though further discoveries will probably render the first course inevitable.

M. oceanica is very closely allied to *M. longicornis* in all essential points, but in the latter the metasome has a crenulated margin, and the sixth segment of the mesosome has a strong spine on each side, whereas in *M. oceanica* the sides of the metasome are smooth, and the sixth segment of the mesosome is without spines. Further, the antepenultimate joint of the maxillipedes is rounded in *M. oceanica* and acutely pointed in *M. longicornis*. In this respect *M. oceanica* resembles *M. Murrayi*. *M. oceanica* may be distinguished externally by the relatively large posterior division of the body and the long uropods.

GENUS *Munnopsoides*, Tattersall.

Munnopsoides, Tattersall, *loc. cit.*

Munnopsis (*pars.*), Beddard, *Challenger Report*, Isopoda.

Very closely allied to *Munnopsis*, M. Sars, but differing in having no palp to the mandible.

The type of this genus is *Munnopsis australis*, Beddard, described from the collections of the *Challenger*. The present form is very closely allied to *M. australis*, only differing in one or two minor points.

There are two other characters which are common to the two species included in *Munnopsoides*, but which do not perhaps deserve to rank as generic. Firstly, the first four segments of the mesosome are very sharply defined from the last three, while the fifth segment is elongate and narrow. Secondly, the two terminal joints of the last three thoracic legs are not so broad proportionally as in a true *Munnopsis*, and only one edge of the last joint bears setae. Beddard's figure of *M. australis* shows the terminal joint of the last three thoracic limbs as having setae on both edges, but a detailed drawing of one of these limbs has only one edge setose.

Unfortunately, these Isopods very seldom reach the surface undamaged. The examples of the species described below (only two in number) arrived with the cephalon detached from the remaining part of the body, and the second, third and fourth thoracic limbs missing. The drawing of the whole animal is, therefore, something of a restoration, and allowance must be made for this fact in examining future individuals of this species.

Munnopsoides Beddardi, Tattersall.

M. Beddardi, Tattersall, *loc. cit.*

Pl. VI., Figs. 1-8.

Body (Fig. 1) elongate, about four times as long as wide at its broadest part, divided into a wider anterior and a narrower posterior portion, the latter a little longer than the former. Under a moderately high power of the microscope the body is seen to be regularly roughened by an armature of very small spinulose tubercles, and has also a covering of short scattered setae most numerous on the cephalon.

Cephalon large, somewhat square in outline, front edge slightly emarginate, slightly raised into a transverse ridge between the bases of the antennae, this ridge carrying a row of prominent rather long and strong setae.

Mesosome with the first four segments subequal in size, much wider than the last three, and very sharply defined from the latter; first very deeply emarginate for the reception of the cephalon; fifth segment somewhat elongate, narrow anteriorly widening somewhat posteriorly; sixth and seventh, small and about as wide as the posterior part of the fifth segment, epimera small and not visible on dorsal view.

Metasome long and narrow, rather less than one-third the length of the body, bluntly rounded posteriorly, with an appearance as if divided slightly into two small obtuse lobes.

Superior antennae (Fig. 2) with the basal joint broadly expanded, triangular in shape, flagellum multiarticulate, first joint very long. In the female the antennae are scarcely one-third of the whole length of the body, in the male they are half the length of the body and much more setose than in the female.

Inferior antennae missing, except for the three basal joints, which are very like those of most *Munnopsidae*.

Mandibles (Fig. 3) consisting of a triangular, simple, rather bluntly pointed plate, obscurely bidentate, no molar process at all; palp entirely absent.

First maxillae (Fig. 4) consisting of two delicate lobes, the outer broader than the inner, both lobes with their tips armed with plumose spines, the inner lobe with one long curved simple seta in addition.

Second maxillae (Fig. 5) composed of three lobes, the inner one broader than either of the other two; tips of all three lobes with plumose spines, the inner one, here also, with one long curved simple seta in addition.

Maxillipedes (Fig. 6) seven-jointed; third joint very small; fourth and fifth broad, the latter with its inner distal corner somewhat acutely produced and armed with a few short simple spines; last two joints very small and very much narrower than preceding joints; epignath well developed and acutely pointed; masticatory lobe obliquely truncate, fringed with short hairs and carrying two sensory processes on the inner edge.

First thoracic legs (Fig. 7) small and simple, second joint long and narrow, merus small, carpus rather longer than propodus, dactylus rather short, whole appendage feebly armed.

Second to fourth thoracic legs missing.

Fifth to seventh thoracic legs (Fig. 8) similar in structure, natatory, carpus long and not so much expanded as in *Munopsis typica*; setae very few, propodus shorter than carpus, narrowly oval in shape, and not as much expanded as usual, with setae on one edge only; dactylus wanting.

Pleopods normal in structure.

Uropods rather short, simple, two-jointed, first joint shorter than the second, armed with scattered setae.

Length: female, 6 mm.; male, 4 mm.

The species is named in compliment to the writer of the Report on the *Challenger* Isopoda, who described the type of the genus, *M. australis*.

Locality, see p. 73.

This species differs from the only other species of the genus in one or two minor points only.

The cephalon is of different shape, though in each species it is rather large.

The first four segments of the mesosome are larger in *M. Beddardi* than in *M. australis*. The fifth segment of the mesosome is longer and narrower in the latter species than in the present one; while the metasome would appear to be somewhat more developed in *M. Beddardi*. The basal joint of the superior antenna is more broadly expanded in the latter than in *M. australis*. The maxillipedes are of different shape in the two species. In *M. Beddardi* the

ante-penultimate joint is acutely produced, and the last two joints are very small. In *M. australis* the antepenultimate joint is not acutely produced, and the last two joints are much larger proportionally than in *M. Beddardi*. The maxillipedes of the latter approach more closely those seen in *Munnopsis typica* than do those of *M. australis*.

The remaining appendages agree closely in the two forms. Especially is this so with the natatory legs, which are longer and slenderer than in *Munnopsis*, with the carpus and propodus much less expanded and less strongly armed.

In the general roughening of the body and the armature of scattered setae, *M. Beddardi* likewise differs from *M. australis* which is apparently smooth.

GENUS *Ilyarachna*, G. O. Sars.

Ilyarachna Plunketti, Tattersall.

1. *Plunketti*, Tattersall, *loc. cit.*

Pl. VII., Figs. 1-9.

Body (Fig. 1) of the usual characteristic form of the genus, from two and a half to three times as long as broad, sharply marked into two distinct regions.

Cephalon slightly emarginate in front, quite smooth.

Mesosome with the first four segments sharply defined from the last three; first segment smaller than the succeeding ones, with its lateral parts armed on each side with a stout spine and strong seta; second segment larger than the first, with similar armature; third and fourth segments with their anterior edges produced into somewhat acutely pointed lappets; fifth segment very slightly wider than the preceding four, and very deeply emarginate posteriorly; seventh segment about one-half as long as sixth.

Metasome about one-quarter of the total length of the body, longer than broad at its base; apex bluntly pointed.

Eyes absent.

Superior antennae (Fig. 2) with basal joint broad and expanded; outer corner more produced than inner one, and tipped by three spines; inner corner tipped with one spine; third joint of peduncle longer but much narrower than second; flagellum composed of six to eight joints in the female, and twelve in the male.

Inferior antennae (Fig. 3) only represented by the four basal joints, which are very much as in *I. longicornis*; the fourth joint is, however, armed with about nine strong setae on its outer proximal edge, and has its outer distal corner armed with three long setae.

Mouth parts exactly as in *I. longicornis*.

First thoracic legs (Fig. 4) rather slender, with the carpus and propodus subequal in length; nail short.

Second thoracic legs (Fig. 5) with the propodal joint shorter than the carpal, dactylus very long, about equal in length to the propodus.

Third and fourth thoracic legs missing.

Fifth and sixth thoracic legs (Fig. 6) of the usual natatory character; carpal joint very much expanded and densely setose; propodus somewhat dilated, and likewise setose; dactylus well developed.

Seventh thoracic legs (Fig. 7) long and slender; carpus shorter than propodus, with its inner edge bearing long setae; propodus with both edges fringed with short setae; dactylus long and slightly curved.

Uropods (Fig. 8) short, biarticulate; basal joint somewhat expanded and fringed with plumose setae; terminal joint short and narrow, and tipped with setae. On the basal joint there is seen under a high power a very small nodule tipped with plumose setae.

Female operculum (Fig. 9) diverging somewhat from type, shield-shaped, very strongly keeled, the keel with a row of strong setae.

Length, 4 mm.

Locality, see p. 74.

The species is named in compliment to the Vice-President of the Department of Agriculture for Ireland.

I. Plunketti differs from *I. hirticeps* in the smooth cephalon, and from *I. denticulata* in the smooth anterior edges of the segments of the body. It is very closely allied to *I. longicornis*, but differs from it—

- (1.) In the armature of the lateral parts of the first four segments of the mesosome.
- (2.) In the fifth segment of the mesosome being distinctly wider than the preceding part of the body.
- (3.) In having the *outer* corner of the basal joint more produced than the inner, whereas in *I. longicornis* the reverse obtains.
- (4.) In the shape of the female operculum.

These differences are very small, but they are constant in over one hundred specimens of the species which were taken.

Unfortunately, all the specimens were damaged. Indeed, for the most part they consisted of the body alone, devoid of all appendages. The above description has been compiled from several specimens.

GENUS *Eurycope*, G. O. Sars.*Eurycope longipes*, sp. n.

Pl. X., Figs. 1-8.

Body (Fig. 1) much more slender than in most species of the genus, its greatest length being rather less than one-third its total length; shape elongate, of even width throughout; anterior and posterior divisions well marked and about equal in size; integument of the cephalon strongly calcareous, hard, and rugose, that of the first four segments moderately calcareous and similarly roughened; the last three segments of the mesosome and the metasome with the integument soft, thin and without calcareous matter or any sculpture at all.

Cephalon large and broad, arched above, and emarginate on either side for the insertion of the antennae.

First segment of the mesosome scarcely broader than the cephalon, epimera small.

Succeeding three segments broader than the first, loosely articulated to one another; epimera well marked.

Posterior three segments of the mesosome considerably larger than the anterior ones and more firmly articulated to each other, strongly arched above; anterior margins very arcuate, lateral parts evenly rounded.

Caudal segment as long as the preceding three segments combined, gradually narrowing to an obtuse apex, anterior margin but slightly arcuate.

Eyes wholly absent.

Superior antennae (Fig. 2) arising from the upper part of the head, and separated from one another by a distinct gap, rather short; basal joint rather large and narrowly squamiform in shape, bluntly rounded anteriorly; rest of antenna arising from the dorsal surface of this joint; last two joints of peduncle small, flagellum rather stout and multiarticulate, the articulations faintly marked at the base, fringed on one edge by long setae.

Inferior antennae broken off in all the specimens, but so much of them as remains not differing much from the same parts in *E. gigantea*.

Mandibles (Figs. 3 and 4) powerfully developed, roughly triangular in shape, cutting edge almost smooth; molar process very large, bluntly rounded, without teeth or armature save a single small spiniform bristle; palp well developed, long and narrow, three-jointed, the second joint elongate and longer than either

of the other two, terminal joint small and very narrow and terminated by a strong seta; rest of appendage feebly armed, with few setae.

First and second maxillae of the usual structure of the genus.

Maxillipedes (Fig. 5) large and lamelliform; antepenultimate and preceding joints broad and greatly dilated, the former rounded evenly on its inner edge; penultimate joint smaller than the two preceding, somewhat expanded, its inner edge not very prominently drawn out; last joint small and narrow; all the joints furnished with setae on their inner edges; masticatory process well developed, tipped by plumose setae, five masticatory hooks on its inner edge.

First thoracic legs (Fig. 6) longer than is usual for the genus, and very slender, almost equalling the body in length; carpus very long and narrow; propodus shorter than the carpus; dactylus distinct though small; the whole limb very feebly armed.

Remainder of the thoracic limbs broken away in all the specimens.

Operculum in the female of the usual form, that of the male (Fig. 8) narrow, and consisting of two distinct parts.

Second pleopods in the female (which correspond to the third pair in the male) very thin and delicate, biramous, the inner ramus forming a broad rounded plate, the outer narrow and curved, projecting beyond the inner, two-jointed, the outer joint the smaller, both joints setose on their outer margins. Second pleopods in the male, transformed in the usual way into accessory copulatory organs.

Remaining two pairs of pleopods in both sexes entirely branchial in nature, the first of them consisting of two broad lamelliform plates, the last of a single plate.

Uropods (Fig. 7) very small, attached on the ventral surface of the caudal segment, some way from the extremity, biramous, inner branch longer than the outer, both branches linear in shape and very feebly armed.

Length of the largest female 10 mm., that of the only male 5 mm.

Locality, see p. 75.

There is only one known species of *Eurycope* with which the present species is at all comparable, namely, *E. gigantea*, G. O. Sars, described from the Arctic Ocean. *E. gigantea* and *E. longipes* differ rather markedly from all the other species of the genus, and ought perhaps to be removed to a new genus. For instance, in the peculiar shape and formation of the superior antenna they are quite different from all the other known species. Moreover, the terminal joint of the mandibular palp is small and narrow in these two species, while in most of the remaining species it is broad and lamelliform, and

well armed. The molar process, further, though well developed is not so sharply marked off from the cutting edge, and both the latter and the molar process are almost smooth. Finally, the penultimate pair of pleopods are widely different from those seen in the other species. In the latter they consist of an inner broad rounded plate, and an outer narrow biarticulated and setose ramus. In *E. gigantea* and *E. longipes*, on the other hand, the penultimate pair of pleopods consists of a pair of broad evenly rounded smooth plates.

E. longipes differs from *E. gigantea* in its more elongate and narrow shape and in the calcareous nature of the first portion of the body. The penultimate joint of the maxillipedes of *E. gigantea* is rather narrow with its inner edge somewhat acutely produced. The same joint in *E. longipes* is broader and more expanded, with the inner edge scarcely, if at all, produced. Finally, the first thoracic legs in *E. longipes* are relatively much longer than in *E. gigantea*. Sars describes the first legs of the latter species as "scarcely more than half the length of the body." In *E. longipes* they are nearly as long as the body, the exact proportions being as seven is to eight.

GENUS *Lipomera*, Tattersall.

Lipomera, Tattersall, *loc. cit.*

Body shaped much as in the genus *Ilyarachna*, compact, posterior part of mesosome sharply defined from the anterior part, seventh segment of the mesosome very much reduced.

Superior antennae with the basal joint expanded, flagellum short.

Mandibles very much as in *Eurycope*, with a three-jointed distinct palp and a well-developed blunt molar process.

First maxillae with two lobes, the inner one being very small and reduced.

Second maxillae of the usual form.

Maxillipedes as in *Eurycope*.

First thoracic legs very slender, dactylus short.

Second thoracic legs longer than the first, very slender, dactylus long.

Third and fourth thoracic legs similar to the second, but rather longer.

Fifth and sixth thoracic legs natatory, with the carpus and propodus expanded and edged with densely plumose long setae; dactylus well developed.

Seventh thoracic leg very much reduced and feeble, consisting of a short, feebly articulate unarmed appendage.

Uropods consisting of a broad lamellar plate folded on itself and carrying on its lower ventral edge a uniarticulate appendage and a plumose spine.

Female operculum broad and triangular in outline, broadly carinated along centre.

Lipomera lamellata, Tattersall.

Lipomera lamellata, Tattersall, *loc. cit.*

Pl. VIII., Figs. 1-14.

Body (Fig. 1) compact, small, rather more than twice as long as broad, distinctly divided into two parts.

Cephalon larger than any of the first four segments of the mesosome, emarginate anteriorly with a slight production in the centre of the anterior edge; unarmed.

Mesosome with the first four segments distinctly marked off from the last three, narrow; the third the largest, lateral parts armed with a single slender spine; fifth segment wider than the preceding part of the body, lateral parts rounded and unarmed, deeply emarginate behind; sixth segment smaller and narrower than the fifth, a single slender seta on the lateral parts, emarginate posteriorly; seventh segment small and reduced, overlapped laterally by the sixth, unarmed.

Metasome triangular in outline, tip obtusely pointed, about one-quarter the total length of the body.

Superior antenna (Fig. 2) with the basal joint of the peduncle expanded, its outer distal corner produced and armed with a long plumose seta; second joint of peduncle about as long as the basal joint, but very much narrower; flagellum in female two-jointed, the first joint small and bearing one very long plumose seta, the last joint longer, carrying at its tip a long apical filament; flagellum in male eight- to ten-jointed.

Inferior antennae (Fig. 2) only represented by the three small basal joints, which are exactly as seen in *Eurycope*.

Mandibles as in the genus *Eurycope*, with a three-jointed palp and a blunt molar process.

First maxillae (Fig. 3) composed of two lobes, a broad and larger outer lobe tipped by numerous strong setae, the inner lobe small and narrow, only about half as long as the outer lobe, and tipped by three simple setae.

Second maxillae (Fig. 4) normal.

Maxillipedes (Fig. 5) much as in the other *Munnopsidae*; fifth joint broad and expanded, inner edge bluntly lobed; sixth and seventh joints small, the sixth with its inner edge drawn out into a lobe tipped with two long setae; masticatory part normal, with two masticatory hooks on the inner edge.

First thoracic legs (Fig. 6) short and slender, carpus very narrow and longer than the propodus; dactylus short; the limbs bear a few scattered setae.

Second thoracic leg (Fig. 7) longer than the first, but still very slender; propodus very slightly longer than the carpus; dactylus long and slender; propodus with a row of short setae on the inner edge; a few scattered longer setae on the limb.

Third and fourth thoracic legs similar to the second, but longer.

Fifth thoracic legs (Fig. 8) natatory in structure; carpus very broadly expanded, both edges bearing numerous densely plumose setae; propodus shorter than the carpus, less expanded, but similarly armed, with the dactylus well developed and slender; a long spine at the base of the dactylus on the outer edge of the propodus.

Sixth thoracic legs (Fig. 9) similar to the fifth but smaller, and with the carpus and propodus less expanded.

Seventh thoracic legs (Fig. 10) very small and rudimentary, consisting of a feebly jointed slender appendage, unarmed save for two plumose setae.

Pleopods normal.

Uropods (Figs. 11 and 12) attached at the side of the metasome and consisting of a broad lamellar plate, which *in situ* is folded on itself longitudinally, has its dorsal edge tipped with three or four short setae, and bears on its ventral edge a plumose stout spine and a uniarticulate appendage tipped with a long fine seta.

Female operculum (Fig. 13) broad and triangular in outline, with a broad blunt carina along its centre.

Male operculum (Fig. 14) small and narrow, each part tapering evenly to an acutely pointed tip.

Length of adult female, 1.25 mm.

Locality, see p. 75.

The general form of the body, and especially the natatory character of the fifth and sixth thoracic legs, give this remarkable little Isopod a place in the *Munnopsidae*, but the latter family contains as yet no species in which the seventh thoracic legs are so reduced and the uropods of such a striking and peculiar form as in this species.

The rudimentary seventh thoracic legs are particularly noteworthy. In newly hatched Isopoda these limbs are absent, while the remaining six thoracic legs are present as unsegmented unarmed appendages. A later stage, still immature, shows the first six legs fully developed, while the seventh are still in a rudimentary condition. *Lipomera lamellata* permanently retains this stage in the adult, for it may here be

noted that several specimens carried eggs, and were at least sexually mature. I do not, however, regard it as a more primitive Muunopsid than any other described form, but rather as a very specialised species in which the post-larval character of the seventh legs is secondarily developed. Specialisation in the direction of reduction of size has, from the exigencies of reproduction, probably led to this arrest of development. A somewhat parallel instance is shown by *Munnella Danteci*, a species belonging to the family *Munnidae* and described by Bonnier from the Bay of Biscay. Here, however, the seventh thoracic legs are completely absent. The size of the species is 1.5 mm., and it is described as sexually mature.

The uropods may be compared to those of *Ilyarachna*, in which the basal joint has become enormously expanded and doubled on itself, at the same time losing its setae, while the terminal joint persists as the uniaarticulate small appendage tipped by a long seta, mentioned above as being on the ventral edge of the uropoda.

TRIBE EPICARIDA.

FAMILY BOPYRIDAE.

GENUS *Scyracepon*, nov.

Female.—

Body broadly oval in outline.

Cephalon simple, elliptical in shape, exhibiting no division into parts.

Mesosome with a dorsal boss on each of the last six segments.

Metasome distinctly segmented.

Legs terminating in a blunt short claw.

Pleopods biramous throughout, the rami coarsely pinnate on one edge.

Uropods uniramous, and coarsely pinnate like the pleopods.

Last marsupial plate tuberculose.

Male.—

Thoracic and first two pleon segments with a median ventral boss.

Pleon without appendages; the first three segments well marked off; remaining two fused with the telson.

Uropods absent.

Eyes present, but very small.

Scyracepon tuberculosa, sp. n.

Pl. XI., Figs. 9-12.

Female.—

Body (Fig. 9) large and, as usual, asymmetrical, broadly oval in outline.

Cephalon elliptical in shape, simple, not divided into parts.

Mesosome with a median dorsal boss on each of the last six segments, forming a well-marked acute carina along the whole body. The boss on the second segment is only faintly indicated. Those on the succeeding segments gradually increasing in size posteriorly, where they appear as very acutely pointed and long processes projecting dorsally. The appearance of the last four bosses is suggestive of the neural spines of the backbone of some vertebrate skeleton.

Metasome with all the segments distinctly defined.

Antennae and mouth parts not differing markedly from those of its allies *Cancricepon* and *Grapsicepon*.

Thoracic legs with the carpus and propodus having their inner edges somewhat acutely produced, the tips of the produced part slightly tuberculose; nail short, base greatly dilated.

The fifth, sixth and seventh thoracic limbs (Fig. 11) exhibit the same peculiar bulging of the margins of their second joints noted by Stebbing in *Tylokepon Bonnieri*. In *Scyracepon tuberculosa* the bulging is much more marked, and the papillae produced by the bulging have their tips slightly tuberculose.

Pleopods in all five pairs biramous, the rami very coarsely pinnate on one edge only, the other edge only showing slight irregularities of their contour. The pleopods gradually decrease in size posteriorly.

Uropods simple, rather longer than the last pleopods with their edges coarsely pinnate.

Marsupial plates as usual for the family with the last pair strongly tuberculose on their posterior half, their posterior margins slightly setose.

Length 10 mm., *breadth* 7 mm.

Male.—

Body (Fig. 10) about three times as long as broad, segments very well defined.

Cephalon semicircular in outline, partly surrounded by the first segment of the mesosome.

Eyes present but small.

Pleon with the first three segments distinctly defined and segmented off, last two fused with the telson.

All the thoracic and the first two segments of the pleon with a median ventral boss, that of the first thoracic segment rather pointed and small, those of the remaining segments having the appearance of evenly rounded, blunt knobs.

First and second antennae each three-jointed, the last joint tipped by a few setae.

Thoracic legs (Fig. 12) remarkably stoutly built and subcheliform; merus and carpus very small, with their edges somewhat produced, produced part tuberculose, and that of the carpus with a small spine; propodus remarkably dilated, its inner edge likewise produced into a strongly tuberculate angle; dactylus strongly recurved, provided with a secondary tooth.

Pleopods and uropods absent.

Length, 4 mm.

Host, *Scyramathia Carpenteri* (Norman).

Locality, see p. 78.

This large and striking form belongs to the *Iomiens*, one of the sub-divisions of the family *Bopyridae* made by Giard and Bonnier. The group is only found parasitic on *Brachyura*.

Scyracepon is distinguished from all the other members of the sub-division, by the possession of a medio-dorsal boss on each of the last six thoracic segments in the female, and by the partially segmented pleon without pleopods and the ventral bosses of the male.

The specific name alludes to the tuberculose last pair of marsupial plates.

Scyracepon tuberculosa is, as far as I am aware, the first member of the family found parasitic on any of the *Ozyrrhyncha*, though *Entione*, a genus of the allied family *Entoniscidae* has long been known from *Achaenus*, one of the genera of this sub-division of *Brachyura*. The phryxoid stage of this species was also met with on one *Scyramathia carpenteri*. It only differed from the adult in being much more symmetrical and in having only faint bosses on the last three thoracic segments.

ii.—THE ISOPODA OF BALLYNAKILL AND BOFIN HARBOURS.

Ballynakill Harbour is a long narrow inlet in the north of the county of Galway, between Clifden and Killary Bays; while Bofin Harbour is on the island of Bofin, one of a group of small islands off the entrance to Ballynakill Harbour. Descriptions and maps of these localities will be found in *Ann. Rep. Fish., Ireland, 1902-03, Pt. II., App., III., [1905]*. The maps are reprinted at the end of this paper.

This part of the paper deals with a list of thirty-seven species, thirty-three of which were actually taken in one or other of the two harbours under notice, while the remaining four have been taken in other harbours on the west coast, and are here included for convenience. They are indicated by being placed between brackets.

No records new to the British and Irish fauna are noted in the list, but the following species do not appear to have been hitherto recorded from the Irish coast :—

Leptognathia longiremis (Lilljeborg).

Paratanais Batei, Sars.

Anthura gracilis (Montagu).

Eurydice spinigera, Hansen.

Eurydice truncata (Norman).

Limnoria lignorum (Rathke).

Idotea neglecta, G. O. Sars.

Iacra marina (Fabricius).

Iacra Nordmanni (Rathke).

Munna Kröyeri, Goodsir.

Munna Fabricii, Kröyer.

Pleurogonium rubicundum, G. O. Sars.

Bopyrus squillarum, Latreille.

Bopyrina virbii (Walz).

On the other hand, *Apseudes hibernicus* and *Idotea metallica* have not yet been recorded from any part of the British Isles except the west coast of Ireland.

ORDER TANAIIDACEA.

FAMILY APSEUDIDAE.

GENUS *Apseudes*, Leach.

Apseudes hibernicus, Walker.

Pl. IX., Figs. 4-7.

BALLYNAKILL.—Common in dredgings from the muddy ground in Coastguard Bay in 5-8 fathoms. Also taken on one occasion in the channel off Ross Point.

BOFIN.—A single specimen was found under a stone on the shore of Port Island Bay in September, 1900.

It would be well to note certain differences between Walker's description and figures of this species and the present examples. In the first place, the fine granulations noticed by Walker on the proximal half of the inner side of the superior antenna are likewise to be found on the sides of the rostrum. It may be mentioned that one of these individuals had a distinct spine at the extremity of the rostrum, though otherwise agreeing well with Walker's description. The ocular lobes and eyes are placed immediately at the base of the superior

antenna, and not some little way below it, as in Walker's figure. The spine present on each side of the first free segment of the pereion seems to have a broader base in all my specimens than Walker's figure shows. The most important difference, however, to be noted is in the armature and structure of the second or fossorial legs. Walker's figure of these appendages shows the dactylus to be only about one-half as long as the propodus, the merus to have two spines on the inner distal corner, and the propodus and carpus to be devoid of spines on their outer margins. All the specimens examined differ from this, in having the dactylus well developed and quite as long as the propodus, in the merus having only one spine at its inner distal corner, and in the propodus possessing two, and the carpus one spine on their outer margins. Walker states in his paper that the spines on these appendages are apt to vary, differing in each leg of the type specimen. On my writing to him about these differences he very kindly informed me that the dactylus in the type was apparently very much worn though correctly figured. A figure of a second or fossorial leg is shown (Pl. IX., Fig. 4), as being the more typical form of the limb in the species. The males only differ from the females in having the first legs or chelipeds more stoutly built, though the armature is similar.

Along with several typical adult examples of this species occurred about a dozen small specimens, evidently immature, as indicated by the small number of joints in the flagella of the antennae (Pl. IX., Figs. 5-6). They all had the rostrum finely granulated.

The most notable difference between these immature forms and adult individuals is the absence in the former of a tubercle on the immoveable finger of the first legs (Pl. IX., Fig. 7).

Distribution.—This species as yet is only known from the west coast of Ireland. The type was found by Dr. Gamble under a stone between tide marks in Valentia Harbour. The species, unlike most members of the genus, is apparently quite a shore and shallow water form.

FAMILY TANAIDAE.

GENUS *Leptochelia*, Dana.

Leptochelia dubia (Kröyer).

BALLYNAKILL.—Common at Ballynakill in dredgings from muddy ground in 5-8 fathoms.

BOPIN.—Common in dredgings from muddy parts of the harbour. Male specimens appear to be very rare, only two out of 106 collected being of that sex.

Distribution.—This species was first added to the British and Irish fauna by Walker, who records it from Valentia. Norman had, however, previously found examples in Birterbuy Bay, W. of Ireland, and at Falmouth, though they were not recorded till after Walker's paper had appeared. This form was also taken by the *Fingal* expedition in 1890, the exact locality being uncertain, and I have taken it in Galway Bay. The species has a very extensive range, having been recorded all along the Atlantic coast from Ireland to Tenerife, from the Mediterranean, from the N.E. coast of America, and from Brazil, where the types originally were obtained.

[GENUS **Paratanais**, Dana.]

[**Paratanais Batei**, G. O. Sars.]

BALLYNAKILL AND BOFIN.—No record.

Examples referable to this species have been taken in some numbers in Galway Bay, off Black Head, Co. Clare, in 5-15 fath. of water.

Distribution.—Known from Falmouth Harbour and Plymouth Sound, Channel Islands, Firth of Clyde, Arran Island, Firth of Forth, and Loch Fyne. It does not seem to have been recorded before from Ireland. Outside Britain it is known from Norway, France, and the Mediterranean.

GENUS **Leptognathia**, G. O. Sars.

Leptognathia longiremis (Lilljeborg.)

BALLYNAKILL.—Only once taken, in January, 1902, in a bottom tow-net from Coastguard Bay to Green Rocks. The tow-net filled with sand.

BOFIN.—There are no records from Bofin.

In the nineteenth Report of the Fishery Board for Scotland, Pt. III., Dr. Scott records a species of *Leptognathia* under the name *L. longiremis* ? var. The present specimens agree absolutely with Scott's descriptions and figures, except that no females were noticed with a five-jointed superior antenna.

They differ, like Scott's, from *L. longiremis* as figured by Sars in the absence of a denticle on the lateral margins of the metasome, and, according to Scott, the males have the inner branch of the uropods only two-jointed. This *Leptognathia* is, according to Hansen, the true *L. longiremis*, Lilljeborg. The species described and figured under this name by Sars is distinct, and will be named *L. Sarsi* by Hansen (*vide* Ohlin, *Bih. K. Sv. Vet. Akad. Handl. Bd. 26, IV., No. 12*).

Distribution.—*L. longiremis* (Sars *nec* Lilljeborg), has been found by Dr. Scott in Loch Fyne, Firth of Forth, and Moray Firth, and is known from Norway, Iceland, Denmark, and Greenland. *L. longiremis* (Lilljeborg) was found by Scott not uncommonly off Aberdeen. I have also taken it in Galway Bay.

GENUS *Tanaopsis*, G. O. Sars.

Tanaopsis laticaudata, G. O. Sars.

Pl. IX., Figs. 9-10.

BALLYNAKILL.—Not uncommonly met with in all parts of Ballynakill Harbour inside the Green Rocks. It occurred twice in bottom townets taken at night over the muddy part of Fahy Bay, and was also washed from a bottom townet in January, 1902, from Coastguard Bay to Green Rocks, which became filled with sand.

BOFIN.—No records.

The present species may be distinguished most easily among Tanaidae by the three spines which terminate the immoveable finger of the chelipeds. I can confirm Scott's observation as to the somewhat larger size of this species in reference to that which Sars states to be the average—one specimen measuring 4 mm., while several measure over 3 mm.

Male specimens do not seem to have been previously recorded. Like the males of the genus *Leptognathia*, they have the superior antenna (Pl. IX., Fig. 9), with a three-jointed peduncle and a four-jointed flagellum clothed with sensory hairs. The joints of the flagellum are subequal, and as long as the last peduncular joint. The metasome (Pl. IX., Fig. 10) is much more pointed in the males than in the females, and its extremity carries several long setae.

The chelipeds of the male are very similar to those of the female, but, again, like the males of *Leptognathia*, bear on the inside of the propodus a row of nine strong setae or spines. The two fingers of the hand are, moreover, equal in size, unlike the males of *Leptognathia*, where the immoveable one is shorter than the other one.

Distribution.—This species has been recorded from several localities in both E. and W. Scotland by Dr. Scott. Stebbing also records it from near Cumhrae, Firth of Clyde, and Norman from Birtherhuy Bay, W. Ireland. I have also taken it in Galway Bay. It extends to the Mediterranean and to Norway.

ORDER **ISOPODA.**

TRIBE **FLABELLIFERA.**

FAMILY **ANTHURIDAE.**

GENUS *Anthura*, Leach.

Anthura gracilis (Montagu).

BALLYNAKILL.—A single male example was taken in Coastguard deep, 6 fath., June, 1902, and three females from Fahy Channel, off Ross Point, 3 fath., September, 1903.

BOFIN.—No record.

Norman and Stebbing, in their account of the Isopoda of the *Porcupine* Expedition, described the male of this species for the first time. Their male specimens were immature, and at the end of their description they predicted that the fully developed male would have the upper flagellum adorned by numerous bands of strong setae. This prediction was confirmed by Garstang, who recorded male examples with such a superior antenna at Plymouth. Garstang's specimens were, however, only 4.5 mm. in length, while the length of Norman and Stebbing's example, which they considered to be immature, was 8 mm. The present male individual is the same size as the last, but has the superior antenna greatly developed and very densely clothed with rings of setae.

Distribution.—This species has only been found up till now on the south coast of England, at Plymouth, Falmouth, and Torquay, and at Jersey. The present record, therefore, considerably extends its geographical range. The limited recorded distribution is rather remarkable, since on the south coast of England it is by no means rare.

FAMILY GNATHIIDAE.

GENUS *Gnathia*, Leach.

Gnathia maxillaris (Montagu).

BALLYNAKILL.—Both males and females are very common in dredgings all over the harbour, while the larvae of both sexes occur plentifully in townets taken at night.

BOFIN.—Very common everywhere, both in dredged material and in townets.

Larvae of this species are also occasionally found as external parasites of small fish, such as young coalfish, pollack, gurnard, and white or sea trout, from all of which species they have been taken at Ballynakill. Scott has also recorded them from the gills of the gurnard and lemon sole.

The colours exhibited by the larvae are often of an exceedingly striking nature. Two or three examples have been taken at Ballynakill of a vivid green colour, which is only partially dissolved out after more than twelve months' preservation in formalin.

Distribution.—Occurs commonly all round our coasts, and has also been taken abundantly in Norway, in the Kattegat, and off the coasts of France. It also extends to the Mediterranean.

FAMILY CIROLANIDAE.

GENUS *Cirolana*, Leach.*Cirolana borealis*, Lilljeborg.

Pl. IX., Fig. 8.

BALLYNAKILL.—Single specimens were found on two occasions on the shore between Coastguard Bay and Baracladdy; while in March, 1904, two specimens were dug out of sand on the same shore. In March, 1900, an example, 25 mm. in length, was found in the stomach of *Acanthias vulgaris*.

BOFIN.—No record.

For records from deep water see p. 63.

A few slight divergences from Sars' diagnosis and figures in these specimens call for some notice. The number of masticatory hooks in the maxilliped varies from one to three, and is not fixed at two, as Sars would seem to suggest.

The shape of the appendage to the second pleopod of the male is not exactly as Sars figures it. The appendage is a moderately stout rod, bifurcating near its extremity into two unequal processes tipped at their distal ends by a number of chitinous hooks or pads (see Pl. IX., Fig. 8). The appendage was, however, correctly figured by Hansen in his memoir on the family.

The basal lobe of the first maxilla cannot accurately be said to bear "plumose setae." It rather bears three strong spines, having a circle of dense setae about their centre. The size of the present specimens is rather larger than that given by Sars, some of them reaching a length of 30 mm.

Distribution.—This form is rather widely distributed round our coasts. It has been recorded from both the east and west coasts of Scotland by Scott, and from the Shetlands, Devon, Channel Islands and W. of Ireland by Norman. It was taken frequently by the *Harlequin* and *Fingal* expeditions off the west coast of Ireland in 1890-1891, at one station particularly, 28 mi. N.W. of Achill Head, when fish caught on long lines had hundreds of immense individuals of this species clinging to them. Indeed, when the lines were lifted, some of the fish (*Acanthias* and *Gadus aeglefinus*) were hardly more than bags of skin full of *Cirolanac*, which had penetrated through the natural orifices and eaten away the tissues (*teste* E. W. L. H.).

It is occasionally found parasitic on fishes. Scott records it from *Raia batis*, *Gadus virens*, *Brosenius brosme*, and *Conger vulgaris*, while it has also been taken from *Acanthias vulgaris* off the west coast of Ireland. It is also frequently found in the stomachs of rays and dogfish.

GENUS *Conilera*, Leach.*Conilera cylindracea* (Montagu).

BALLYNAKILL AND BOFIN.—There are no records of this species from these harbours, though a single male specimen, 16 mm. long, was taken 1 mi. N. by E. of Cleggan Head, Co. Galway, 21 fath., just at the entrance to Ballynakill Harbour, in the seas between the Bofin Archipelago and the mainland. I have also taken it on clean shelly ground on the inside of the Aran Islands, Galway Bay.

The stylet of the second pleopod of the male, unlike that of the preceding species, is a rather slender, simple, finely pointed rod.

Distribution.—This species is known from the coasts of Devon and Cornwall, from the Clyde, Skye, and Bantry Bay, Ireland. It also extends to the Mediterranean and Channel Islands. Norman notes the remarkable fact that the species is unknown from the east coast of England and Scotland, from Norway and from Denmark.

GENUS *Eurydice*, Leach.*Eurydice pulchra*, Leach.

BALLYNAKILL.—No record.

BOFIN.—A single specimen occurred on each of three occasions in July and September, 1899, and September, 1900, in townets taken at night in the outer harbour. They were all surface townets.

A single specimen was also met with in a townet taken in Achill Sound in April, 1899.

Distribution.—This species would not appear to be so common on the west coast of Ireland as it is in most other British localities. Indeed, during a period of five years only four specimens were met with. It extends from Norway to the coast of France, and also to the Mediterranean, where it has been recorded by Gourret.

Eurydice spinigera, Hansen.

BALLYNAKILL.—Was not actually met with in the harbour, but occurred on four occasions in surface townets at the entrance to the harbour.

BOFIN.—Taken on three occasions in surface townets at night in the outer harbour.

This species may be distinguished from its congeners by the rather narrow and slightly emarginate posterior edge to the telson, armed at each side with two prominent spines, and also tipped with long plumose setae.

Distribution.—First described by Hansen in his monograph of the family, 1890, but the exact locality at which his specimens were captured is not given. It has since been recorded from the South of England by Stebbing and Norman.

All the above specimens were taken in surface townets. The species would therefore appear to be pelagic in habit.

***Eurydice truncata* (Norman).**

Pl. XI., Figs. 5-8.

BALLYNAKILL AND BOFIN.—Very commonly met with in townets at both places. It was especially abundant during the summer and autumn of 1900 in the seas round the island of Bofin.

This species belongs to the same section of the genus *Eurydice* as *E. inermis*, Hansen. Indeed it would seem to be very closely allied to this latter species. In view of the large number of specimens of *E. truncata* in my hands I am able to add a few particulars to the descriptions of Norman and Hansen. These concern chiefly the sexual differences exhibited by the species. In addition to the usual stylet on the inner lamella of the second pair of pleopods the males of *E. truncata* also exhibit a rather marked difference from the females in the superior antenna. In the latter, the superior antenna (Fig. 5) is short, and does not differ very greatly from the same appendage in *Eurydice pulchra*, except that it is somewhat more slender. In the adult males (Fig. 7), however, it is very much longer and more slender than in the female, due to the elongation of the joints of the flagellum. It extends to about the third or fourth segment of the mesosome, and is not as setose as usual, but has the terminal joint tipped by one very long fine seta. An exactly similar superior antenna is depicted for *E. orientalis* by Hansen, and I am convinced that males of *E. inermis*, when examined, will be found to show a similar sexual difference in these appendages. It may be noticed that *E. truncata*, *E. inermis*, and *E. orientalis* have the plumose setae which arm the posterior edge of the telson short and feeble, while *E. Grimaldii* and *E. spinigera*, which do not show any very marked sexual difference in the superior antenna, have these setae considerably stronger and longer.

Distribution.—This species was added to the British fauna by Norman for specimens from Shetland. It has since been taken off the west coast of Scotland and England by the *Knight Errant* and *Porcupine* expeditions, and also at Naples.

Most of the above specimens were captured in townets, and the species seems essentially pelagic in habit.

FAMILY LIMNORIIDAE.

GENUS *Limnoria*, Leach.*Limnoria lignorum* (Rathke).

BALLYNAKILL.—This small species was found boring in the bottoms of two hulks moored in Ballynakill Harbour, which were beached for cleaning in February, 1904. It was also found in wooden oyster "caisses" staked at the head of Fahy Bay in 1903 and 1904.

BOFIN.—No record.

Distribution.—The species has a very extensive distribution in European and North American waters generally. In local distribution it appears to be capricious. For instance, while it is said to have destroyed some wooden piling at the Aran Islands, at the mouth of Galway Bay, it has not been observed to attack the oyster "caisses" which have for the last two years been staked at Ardfry, at the head of the bay.

FAMILY SPHAEROMIDAE.

GENUS *Sphaeroma*, Latreille.[*Sphaeroma serratum* (Fabricius).]

BALLYNAKILL AND BOFIN.—No record.

This common Sphaeromid was not actually met with in either Ballynakill or Bofin Harbours. It was, however, found under stones at high water mark in Clifden Harbour, the next harbour to the south of Ballynakill Harbour, Co. Galway, and also under stones between tide-marks at Ardfry, near Galway.

Distribution.—Very plentiful everywhere round our coasts in shallow water. It is quite at home either in very brackish water or in localities where very little fresh water enters the sea. It extends to the coasts of France and the Mediterranean.

[*Sphaeroma Hookeri* (Leach).]

Though not found either at Ballynakill or Bofin, this species is included in the present list for specimens taken about two miles above Londonderry, on the banks of the River Foyle, in August, 1904.

Distribution.—Though never very plentiful it is rather widely distributed round our coasts, chiefly in brackish water. It has been recorded from Suffolk, Sussex, Belfast Lough, Strangford Lough, Clevedon, and the Channel Islands.

GENUS *Naesa*, Leach.*Naesa bidentata* (Adams)*Dynamene rubra*, Montagu.*D. viridis*, Leach.? *D. Montagu*, Leach.

BALLYNAKILL.—Under a stone, Ross shore, Ballynakill Harbour, January, 1903—one male.

From *Saxicava*-bored limestone, Black Rocks, Ballynakill Harbour, March, 1904—several males and females.

BOFIN.—No record.

The list of synonyms given above is indicative of the great variability in form and the sexual differences exhibited by the species. There is little doubt that *D. viridis* was founded on green *D. rubra*, and this view is strengthened by the fact that both species are recorded by Bate and Westwood as being taken together. Closer investigation and wider knowledge of the group as a whole have likewise shown that *Naesa bidentata*, Adams, is merely the male form of *D. rubra*, though the outward appearance of the two forms would not seem to support this view, so vastly different do they look.

I am further inclined to the view expressed by Mr. Stebbing, that *D. Montagu* of Leach is merely a young male of *N. bidentata* in which the backwardly directed processes of the sixth segment of the mesosome are just beginning to develop. Forms corresponding to all of the above supposed distinct species have been taken together.

A cryptoniscid larva closely corresponding to Sars' Cryptoniscid No. 2 (Crustacea, Norway, Vol. II.), was found attached to the ventral surface of the pleon of a female of this species. It differed chiefly from Sars' figures in having the cephalosome broader and more semicircular. I am not aware that any *Epicarida* have ever been found on members of this family before.

Distribution.—*Naesa bidentata* is of constant occurrence in shallow water round our coasts. It also extends to the Channel Islands and the Mediterranean.

GENUS *Cymodoce*, Leach.*Cymodoce truncata* (Montagu).

BALLYNAKILL.—Taken on one occasion only, in March, 1901, from a *Saxicava*-bored limestone boulder.

BOFIN.—Taken on two occasions in 1899, viz., off the Gun Rock in 16 fath., and in the outer harbour between tide marks.

Distribution.—This species is quite a common one round our coasts in shallow water. It also occurs in the Mediterranean.

TRIBE VALVIFERA.

FAMILY IDOTEIDAE.

GENUS *Idotea*, Fabricius.

Idotea baltica (Pallas).

BALLYNAKILL AND BOFIN.—Common everywhere on *Laminaria* and seaweeds generally. Often taken at the surface in a coarse meshed net towed rather rapidly.

The stylet of the second pair of pleopods in the male is not at all constant in the relation which it bears to the length of the pleopod itself. Sars describes it as "not extending to the end of the inner plate," but in one single haul I have found some males in which the stylet was quite as long as the lamella of the pleopod, and others in which it was very little more than three-quarters of that length. Similar variations in the proportional length of the stylet were noticed in *I. neglecta*.

Young examples of this species are difficult to distinguish from such species as *I. pelagica*, *I. granulosa* and *I. viridis*, in which the telson has a very similar shape.

Distribution.—Very widely distributed everywhere round our coasts in littoral waters, and extending from European waters generally to the North Atlantic coast of America.

Idotea pelagica, Leach.

BALLYNAKILL AND BOFIN.—Not infrequently met with among fixed and floating algae.

Distribution.—Dr. Norman, in a recent paper on the British members of the family *Idoteidae*, states that this species is rather scarce on all our coasts. It is recorded by him from S.W. Ireland, and also from Aberdeen. Outside British and Irish waters it is only known from Norway and the north coast of France.

Idotea granulosa, Rathke.

BALLYNAKILL.—Only twice taken, in both cases from *Laminaria*.

BOFIN.—Occurred on two occasions in gatherings from *Laminaria*.

Distribution.—This species has probably been overlooked several times in consequence of its resemblance to young forms of *I. baltica*. It has been recorded by Walker from Bray, Dungarvan, Valentia and Dalkey, in Ireland, and by Norman from Northumberland and Berhaven. Outside the British Isles it is only known from Norway, where it occurs sparingly.

***Idotea viridis* (Slabber).**

BALLYNAKILL AND BOFIN.—Not uncommonly met with in both harbours in gatherings from *Laminaria* and *Zostera*.

I have recently taken this species in considerable numbers in a saleen on the shores of Kilronan Harbour, Aran Islands. The bottom of the saleen consisted of a soft mud with *Ulva* growing in profusion over it.

Distribution.—This form was first recorded as British by Walker, who took it at Valentia. It has since been recorded by Norman from two localities in the South of England, and also from the Channel Islands. It is likewise found off Norway, Holland and France; in all cases in quite shallow water.

***Idotea neglecta*, G. O. Sars.**

BALLYNAKILL.—Taken on one occasion only in the hollowed out stems of dead *Laminaria* dredged in 5 fath. Several specimens were all crowded together in such hollowed stems.

BOFIN.—A single specimen only, met with at the surface among floating weed.

This is a species of *Idotea* recently detected by Sars off the coast of Norway. It resembles *I. baltica* in many respects, but even at its very largest size it never shows any signs of the tridentate telson characteristic of *I. baltica*.

The examples noted above agree well with Sars' description, and figures, except in the length of the stylet proportionately to the second pair of pleopods in the male. In all the males I have examined, this stylet was longer proportionally than in Sars' figures, being at least three-quarters of the length of the lamellae of the pleopods, and sometimes even more than this. There seems to be a rather distinct carina running down the whole length of the telson.

Distribution.—This species was recently added to the British fauna by Scott. Previously it was only known from Norway. Scott, however, records it from the Moray Firth, and Norman has also noted its occurrence at Shetland, Falmouth, and Plymouth.

***Idotea emarginata* (Fabricius).**

BALLYNAKILL AND BOFIN.—With *I. baltica* this species is the commonest Isopod met with in both harbours. It occurs most commonly among *Laminaria*, and is to be met with at the surface among floating weed of all kinds.

The differences between this form and *I. metallica*, with which it has been confounded by Gourret, are enumerated under the latter species.

Distribution.—This species is very generally distributed all round our coasts, and occurs also off Norway and the Kattegat.

***Idotea metallica*, Rosc.**

BALLYNAKILL.—No record.

BOFIN.—One male and one female specimen were taken in July, 1900, at the surface between Inisgort and the Gun Rock.

In the *Annales du Musée d'Histoire naturelle de Marseilles*, T. IV., 1891, Gourret describes and figures a species of *Idotea* which he calls *I. emarginata* (type, Fabricius). From his descriptions and figures it is certain that he was really dealing with the present species. In colour, form and habit, the two agree in every way.

I. metallica may be distinguished from *I. emarginata* very readily by the presence of a small supplementary segment between the cephalon and the first segment of the thorax. Further, the telson in *I. emarginata* is, as its name implies, emarginate on its posterior edge, while *I. metallica* has this edge of the telson straight. The male stylets of the second pair of pleopods in the male are longer than the lamellae of the pleopods in *I. metallica*, and shorter in *I. emarginata*. Finally, the colour of the two forms affords a ready means of distinction. *I. metallica* is a uniform dark steel blue colour, while *I. emarginata* is variously coloured and mottled. Dr. Scharff, of the Museum of Science and Art, Dublin, very kindly sent me the specimen of *I. metallica* taken by Haddon in 1890 off Achill Head, to compare with the present specimens.

Distribution.—This species has only once previously been taken in British waters, Haddon having taken a single specimen from the surface off Achill Head, in 1890, during the cruise of the *Fingal*. Dr. Norman has recently recorded this specimen in his paper on the British species of *Idotea*. The species is, however, very common in the Mediterranean, and is also known from N.E. America. Its general habitat would seem to be among floating colonies of *Cirripedia* or on floating timber covered with barnacles. It is a purely oceanic species, and its occurrence at Bofin is probably due to its having floated in on some timber.

***Idotea linearis* (Pennant).**

BALLYNAKILL AND BOFIN.—Very commonly met with in both harbours.

Distribution.—Though generally widely distributed round our coasts, this species, curiously enough, does not occur off the Norwegian coasts. It would seem to be confined to the British Isles and the Mediterranean.

TRIBE ASELOTOTA.

FAMILY IANIRIDAE.

GENUS *Ianira*, Leach.*Ianira maculosa*, Leach.

BALLYNAKILL.—A single specimen was taken in June, 1902, from Coastguard Deep, 6 fath.

BOFIN.—No record.

Distribution.—This species has a very wide geographical distribution, extending along the coasts of Europe from Norway to France, and it is also known from Greenland. It is quite a common form round our coasts.

GENUS *Iaera*, Leach.*Iaera marina* (Fabricius).

Pl. IX., Fig. 11.

BALLYNAKILL.—Rather common under stones between tide marks, especially at those points where a stream of fresh water enters the bay.

BOFIN.—No record.

The difference which separates this species from *I. Nordmanni* are enumerated under the latter species.

Distribution.—This form has rather a wide range of geographical distribution, having been found on the Atlantic coast from Norway to France, the British Isles, Greenland, and the Atlantic coast of North America.

It is quite commonly met with all round our coasts, occasionally in company with the next species.

Iaera Nordmanni (Rathke).

Pl. IX., Fig. 12.

BALLYNAKILL.—Taken in company with the last species, under stones between tide marks.

BOFIN.—Several examples were met with in 1899 under stones between tide marks, in the outer harbour.

This species is very closely allied to the last, and has doubtless by many writers been confounded with it. There are, however, a few well marked characters by which it may be distinguished from *I. marina*. It is of rather smaller size than the latter, and is shorter and proportionally broader. Moreover, it has a regular and dense armature of strong and short bristles, whereas *I. marina* has a few short simple setae on the lateral edges of the segments of its body.

The inferior antenna in *I. Nordmanni* is scarcely more than one-third of the total length of the body, while in *I. marina* it reaches to more than half that length. The uropods in the latter species are not nearly as rudimentary as in *I. Nordmanni*. The males are very readily distinguished by the extent of the male operculum and the shape of its middle piece. In *I. marina* the male operculum entirely covers the pleopods and the middle piece (to quote Sars) "forming at the end, on each side, a rather large expansion terminating in a hook-like anteriorly curving point." In *I. Nordmanni*, on the other hand, the male operculum scarcely more than half covers the pleopods, and the middle piece is long and narrow, with no lateral expansion.

Figures of the middle piece of the male operculum of both *I. marina* and *I. Nordmanni* are shown (Pl. IX., Figs. 11-12). They are drawn to the same scale, and are taken from specimens of nearly equal size. Sars, in his account of the crustacea of Norway, is of opinion that the form figured by Spence Bate and Westwood under *I. Nordmanni* is really the male of *I. marina*. From this opinion I find it necessary to dissent. In the general proportions of the body, and especially in the length of the inferior antenna, Bate's figures agree essentially with *I. Nordmanni*, while his figure of the ventral view of the metasome, P, and the enlarged figure of the male operculum itself, P¹, definitely prove that he was dealing with Rathke's species, and not with *I. marina*.

Distribution.—Owing probably to its confusion with *I. marina*, this species has not been very frequently recorded from our coasts. It was found by Spence Bate at Plymouth, and Langland Bay, South Wales. Scott has taken it in Loch Fyne, in Scotland, while Walker and Hornell record it from the Channel Islands. It was first found by Rathke in the Caspian Sea.

FAMILY MUNNIDAE.

GENUS *Munna*, Boeck.

Munna Kröyeri, Goodsir.

BALLYNAKILL.—A single example taken on each of two occasions at the north entrance to the harbour, 7 fath.

BOPIN.—A single specimen was taken in June, 1899, in the outer harbour.

This species, the member of the genus most commonly met with in British waters, is at once distinguished by the peculiar hook-like appearance of the uropods.

Distribution.—First described by Goodsir from specimens found in the Firth of Forth; this species has since been met with at Cumbrae (Dr. Robertson), in the Firth of Clyde (Hoyle), Northumberland coast, Plymouth, Salcombe, and the Channel Islands.

It also occurs off Norway and the Kattegat.

Munna Fabricii, Kröyer.

BALLYNAKILL.—Met with twice in 1903, once in a dredge in Coastguard Deep, 6 fath., and once at the north entrance to the harbour, 7 fath.

BOFIN.—No records.

This species may be distinguished from its northern congeners, except *M. palmata*, by the structure of the superior antenna, which has the flagellum four-jointed, the two central joints being rather long and subequal and the last joint very small. *M. palmata* has a superior antenna of similar structure, but is at once distinguished by its relatively shorter and stouter inferior antenna and its much more strongly built legs.

Distribution.—It is now only for the second time recorded from British and Irish waters. It was first discovered off Greenland by Kröyer, and has since been taken off Finmark and Norway, Iceland and Spitzbergen. It has also been recorded by Harper from the N.E. coast of America. It thus has a very extended somewhat Arctic distribution. Walker has recorded it from the Liverpool Bay area, in 1889.

GENUS **Pleurogonium**, G. O. Sars.**Pleurogonium rubicundum**, G. O. Sars.*

BALLYNAKILL.—Taken rather abundantly in Coastguard Deep, both in the shelly and muddy parts, in 6-8 fath.

BOFIN.—No records.

I agree with Canon Norman in regarding *Leptaspidia*, Bate and Westwood, as a synonym of this genus, and would suggest that the genus was founded on male examples of *Pleurogonium*. Males are not nearly so broad proportionally as females, and the anterior four segments of the mesosome are not so closely fused together.

Distribution.—This species was added to the British list by Canon Norman, who records having taken it at Cumbrae. Dr. Scott has since recorded it from two or three more Scottish localities—Firth of Forth, Aberdeen, and off Montrose.

Outside the British Isles it is only known from Norway.

TRIBE ONISCOIDA.

FAMILY LIGIIDAE.

GENUS **Ligia**, Fabricius.**Ligia oceanica** (Linn.)

BALLYNAKILL AND BOFIN.—Common everywhere under stones at high water mark.

Distribution.—This species has a geographical range extending to all European countries which border on the Atlantic. In the Mediterranean it is replaced by *Ligia italica*.

* See also p. 81

TRIBE EPICARIDA.

FAMILY BOPYRIDÆ.

GENUS *Bopyrus*, Latreille.*Bopyrus squillarum*, Latreille.

BALLYNAKILL.—Taken on one occasion only from under the carapace of the common prawn, *Palaemon serratus*, from Coastguard Deep.

BOFIN.—No record.

Distribution.—Perhaps the commonest Epicarid found in British and Irish waters. It is only known to infest *Palaemon serratus* and the allied species, *P. squilla* and *P. Fabricii*.

It has been recorded from Plymouth and the Exe estuary, from Cornwall and from the Channel Islands, though it must be very much commoner than the scanty records would suggest. I have found it remarkably prevalent on prawns captured at Ardfry, at the head of Galway Bay.

GENUS *Bopyrina*, Kossmann.*Bopyrina virbii* (Walz).

BALLYNAKILL.—No record.

BOFIN.—A single specimen, rather mutilated, from *Hippolyte varians*, 1900.

Distribution.—Stebbing, in his History of Crustacea, records this species from *Hippolyte varians* taken at Ilfracombe. This record is, therefore, the second one for British and Irish waters. It is found also in the Mediterranean. The original host on which it was found is *Hippolyte viridis*. Bonnier, on the principle of one species of parasite to one species of host has recently named the *Bopyrina* from *H. varians* *B. Giardi*. The points of difference between the latter and *B. virbii* do not seem worthy of emphasis by a separate specific name.

[GENUS *Pseudione*, Kossmann.][*Pseudione Hyndmanni* (Bate and West.)]

BALLYNAKILL AND BOFIN.—No record.

Several specimens of this species have been taken at various points in Galway Bay, infesting *Eupagurus bernhardus*.

Distribution.—First recorded from Ireland by Bate and Westwood. It has since been recorded from Norway by Sars, and from the Firth of Clyde by Scott. The latter states that his specimen was taken from *Hippolyte varians*. This would appear to be somewhat remarkable, since *Pseudione* was only known previously from the group *Anomura* and the Lower *Macrura* like *Callinassa*.

GENUS *Pleurocrypta*, Hesse.*Pleurocrypta galathea*, Hesse.

BALLYNAKILL.—A single specimen from *Galathea squamifera*, taken in Coastguard Deep, 7 fath., April, 1900, and another from the same host in March, 1901.

BOFIN.—No record.

The first of the above two specimens was much smaller than the second, and appeared to agree in all respects with *Pleurocrypta longibranchiata* as re-described recently by Sars. The larger specimen was, however, undoubtedly referable to *Pleurocrypta galathea*. Messrs. Giard and Bonnier have already suggested that the former species is in reality only a younger stage in the development of the latter species, but Sars rejects this suggestion. From a study of the above two specimens, I am inclined to agree with Messrs. Giard and Bonnier, more especially as it would be most remarkable for two species of a single genus to infest the same species of host.

Distribution.—Not uncommonly met with on the south coast of England and north coast of France, infesting *Galathea squamifera*. It has been recorded from the Shetland Islands by Norman, and is also known from Norway.

GENUS *Athelges*, Hesse.*Athelges paguri*, Rathke.

BALLYNAKILL.—A single specimen from a Pagurid, in March, 1902, from the east of Black Rocks.

BOFIN.—No record.

Distribution.—The host of this species is *Eupagurus bernhardus*. Scott has recorded the occurrence of this species in Loch Fyne and Gulland Bay, while Spence Bate received specimens from Strangford Lough, Ireland, Polperro, Cornwall, and St. Andrews. It is therefore well distributed round our coasts. It extends to Norway, Kattegat and Skagerack, and the French coast.

What appears to be the same species has since been met with in Galway Bay infesting both *Anapagurus laevis* and *Eupagurus Prideauxi*.

Epicarida Larvae.

Besides the adult *Epicarida* noted above numerous larval forms belonging to the genus *Microniscus* were of constant occurrence in townets both at Ballynakill and Bofin. They could not with certainty be referred to any species of adult Epicarid, and they are merely noted below with a few remarks on some of the forms taken. Sars has shown that the genus

Microniscus must no longer be regarded as the type of a separate family of *Epicarida*, but that it merely represents the transitory larval stages of the different families of the group. Giard and Bonnier, however, still hold that it represents a distinct family.

Two types of larvae are commonly met with in townets: one, identical with or very closely allied to *Microniscus calani* described by Sars, and now regarded by him as the type of the larvae of the family *Bopyridae*, and another, which he looks upon as the typical larva of the family *Cryptoniscidae*. Both types of larvae are met with off Bofin and Ballynakill.

Bopyridae.—The larvae belonging to this family which occurred in the collection are nearly all referable to *Microniscus calani*. They occur commonly all the year round, very frequently attached to copepods.

Cryptoniscidae.—Most of the larvae of this family which occurred seem to agree with that form described and figured by Sars in his account of the Crustacea of Norway, Vol. II., Isopoda, Pl. 92, Fig. 2. Some, however, are also referable to *Cryptothir balani*.

The occurrence of a *Cryptoniscid* larva on a member of the family *Sphaeromidae* calls for some note. No *Epicarida* have previously been noted from this family, though Sars has found them in the allied family *Aegidae*, while they are also known from the *Idoteidae*. A single specimen of a *Cryptoniscid* larva was found attached to the under surface of the telson of *Naesa bidentata* taken from bored limestone in Ballynakill Harbour. It was of the usual shape, with the cephalon evenly rounded in front and semicircular in shape. Neither the basal joint of the antennule nor the coxal plates appeared to be pectinate. Eyes were absent. The outer uropod was about one half the length of the inner, and both were tipped with rather long setae. The antennules reached to about the second thoracic segment. Its length was 8 mm.

iii.—ISOPODA FROM THE ATLANTIC SLOPE OFF THE WEST COAST OF IRELAND.

The area explored by the *Helga* with bottom nets extends seawards as far as the 500 fath. line. Between this and the 1,500 fath. line nets have only been used at some distance from the bottom, the maximum depth to which they have been sunk being 1,000 fath. It is naturally the bottom nets which have provided the bulk of the isopod material; and though the shoreward limit of the area of exploration here discussed ranges into littoral water of less than 20 fathoms, the gatherings made between 100 and 500 fath. are responsible for the most interesting records. This is by no means surprising, since here the *Helga* was working over practically virgin ground.

The records include the ten new species described in Part I., and the following fourteen, which are now for the first time noted as occurring within the British and Irish area :—

- Typhlotanais tenuicornis*, G. O. Sars.
Typhlotanais Richardi, Dollfus.
Caecognathia stygia (G. O. Sars)?
Aega arctica, Lütken.
Cymodoce granulatam, M.-Ed.
Munna limicola, G. O. Sars.
Ischnosoma bispinosum, G. O. Sars.
Desmosoma lineare, G. O. Sars.
Eurycope latirostris, G. O. Sars.
Eurycope megalura, G. O. Sars.
Eurycope producta, G. O. Sars.
Pleurocryptella formosa (G. and B.).
Asconiscus simplex, G. O. Sars.
Notophryxus sp.

The following, already known from the waters of Great Britain, are now recorded from Irish localities :—

- Leptognathia breviremis* (Lilljeborg).
Aega ventrosa, M. Sars.
Aega crenulata, Lütken.
Cirolana Hanseni, Bonnier.
Paramunna bilobata, G. O. Sars.
Pleurogonium inerme, G. O. Sars.
Eugerdia tenuimana, G. O. Sars.
Eurycope phallangium, G. O. Sars.
Aspidophryxus peltatus, G. O. Sars.

Four species, not yet known from Great Britain, are recorded from additional localities in Irish waters, viz. :—

- Apseudes spinosus* (M. Sars).
Apseudes grossimanus, Norman.
Calathura brachiata (Stimpson).
Munnopsis Murrayi, Walker.

These, with the ten new species and the fourteen now for the first time recorded from within the limits of Norman's "British" area, make a total of twenty-eight species which, within that area, have so far been met with only off the west coast of Ireland.

Of the littoral species dealt with in Part II. only six occur also in the deep water list, namely :—*Gnathia maxillaris*, *Cirolana borealis*, *Eurydice truncata*, *Idotea metallica*, *Ianira maculosa* and *Munna Krøyeri*—a circumstance which affords a clear illustration of the difference between the littoral and deep-water Isopodan fauna.

Altogether, forty-nine species are noted in this part of the paper, which number, allowing for the six common to shallow and deep water and including three species noted from the

east coast but not occurring in the west coast collections (see p. 80), makes a total of eighty-three species represented in our collections from littoral and deep waters.

At present the complete British and Irish marine list comprises one hundred and thirty-five species, while one hundred and twenty have been recorded by Sars from Norway.

In all probability many more Norwegian forms will be found to extend to the west of Ireland, since, as far as at present known, the fauna of that region approximates in Isopoda to that of Norway more than to that of the other parts of the British and Irish area.

ORDER TANAIIDACEA.

FAMILY APSEUDIDAE.

GENUS *Apsedes*, Leach.

Apsedes spinosus (M. Sars).

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, 320 fath., August, 1903, towed on trawl.—One, male, 10 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 375 fath., November, 1904, dredge.—One.

Porcupine Bank, Lat. 53° 1' N., Long. 14° 34' W., 293 fath., May, 1905, towed on trawl.—Two.

Norman and Stebbing, in their account of the *Apsseudidae* of the *Porcupine* Expedition, state that the front margin of the carpus of the first gnathopods is armed with two teeth. Sars' figures of this appendage, in his account of the Crustacea of Norway, show two larger and a third small tooth on the front margin of the carpus. The present specimen shows three well developed teeth on that joint.

Distribution.—This appears to be only the second record of the species for British and Irish waters, the *Porcupine* having obtained a single female example off the S.S.W. of Ireland at 725 fathoms.

It is found abundantly off the Norwegian coast, and has also been recorded from Finmark, Sweden, Denmark, and the Bay of Biscay.

Apsedes grossimanus, Norman.

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, February, 1903, 320 fath., towed on dredge.—One mature male, 10 mm., and two immature females, 4 mm.

The small females only differ from the description given by Norman and Stebbing (*Trans. Zool. Soc.*, 1886) in the fewer number of joints in the flagella of the antennae and in the proportionally rather shorter antennal scale, characters of undoubted immaturity. The male specimen, which measured 10 mm., agrees perfectly with the above-mentioned description.

Distribution.—This species was first discovered by the *Porcupine* Expedition in 90 fathoms off the S.W. of Ireland. Its rediscovery off the W. coast after a lapse of twenty-five years is interesting.

It is also known from the coasts of Portugal in 740 fathoms, where it was taken also by the *Porcupine*, and from the Bay of Biscay, where the *Travailleur* expedition obtained it. Lo Bianco records two specimens from the Mediterranean. The species seems to have a wide vertical range, 90-740 fathoms.

Its geographical distribution at present confines it to the N.E. Atlantic Slope and Mediterranean.

FAMILY TANAIIDAE.

GENUS *Typhlotanais*, G. O. Sars.

Typhlotanais tenuicornis, G. O. Sars.

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, 320 fath., February, 1903, townet on trawl.—One female.

Distribution.—This is the first record of the species for the British and Irish area, and, indeed, up till now it has only been taken off the coasts of Norway in depths from 60-120 fathoms.

The genus *Typhlotanais* until quite recently was unrepresented in the British and Irish fauna, though no fewer than nine species were known from Norwegian waters. However, in 1897 Walker recorded the genus (giving no species) from Valencia Harbour, while Scott (19th Rep. Fish. Board, Scot.) recorded *T. brevicornis* from 50-55 fathoms, 13 mi. N.E. of Buckie, on the E. coast of Scotland. *T. tenuicornis* is now recorded, while a new species of the genus, also from British waters, is recorded below.

Typhlotanais Richardi, Dollfuss.

HELGA.—77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, townet on dredge.—Two.

The two specimens which I refer to this species agree perfectly with Dollfuss' description except that the first free segment of the mesosome is only one-fifth instead of one-third the length of the cephalosome, and is rather deeply emarginate on its anterior border.

Distribution.—Previous to the above record, only known from a single specimen taken at the Azores by the *Hirondelle*.

Typhlotanais proctagon, Tattersall.

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a tow-net attached to a trawl.—Twenty-four females, 4-6 mm.

Fifty mi. W.N.W. of Tearaght, Co. Kerry, 320 fath., February, 1903, tow-net on trawl.—Four females, 4-6 mm.

Distribution.—These are the only records so far of this species. It is a moderately deep-water form, the localities from which it was taken having depths of 200 and 320 fathoms. Indeed, all the species of the genus with a ventral spine on the second segment of the thorax seem to inhabit deeper water than those in which the spine is absent.

GENUS **Leptognathia**, G. O. Sars.

Leptognathia breviremis (Lilljeborg).

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, 320 fath., February, 1903, tow-net on trawl.—One female.

Distribution.—This species has already been recorded from Plymouth by Norman, and from Moray Firth, Loch Fyne, Firth of Forth, and off Aberdeen, by Scott. It has also been taken in the course of the International investigations at 150 fathoms, half way between the Orkneys and the coast of Norway, in some sand which came up in a "bottom" tow-net.

Outside British and Irish waters the species is known from Norway, Sweden, and the Kattegat.

ORDER **ISOPODA**.

TRIBE **FLABELLIFERA**.

FAMILY **ANTHURIDAE**.

GENUS **Calathura**, Norm. and Stebb.

Calathura brachiata (Stimpson).

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up by a tow-net attached to a trawl.—One female.

77 mi. W. of Achill Head, 382 fath., August, 1901, tow-net on trawl.—Two females.

I agree with Norman and Stebbing in regarding the *Calathura norvegica* of Sars as synonymous with this species.

Distribution.—The geographical distribution of this species is somewhat remarkable for its extent. It has been found on the east coast of America, Norway, and at six different stations during the *Porcupine* expedition, extending from the seas between the Shetlands and Faroe to the Bay of Biscay. Its bathymetrical range is likewise considerable, it having been obtained at practically all depths between 20 and 1,360 fathoms.

Since the *Porcupine* expedition *C. brachiata* has not been recorded from British and Irish waters.

FAMILY GNATHIIDAE.

GENUS *Gnathia*, Leach.

Gnathia maxillaris (Montagu).

HELGA.—40 mi. W. by S. of Cleggan Head, Co. Galway, 74 fath., July, 1901, mid-water townet, 35 fath.—One larva.

60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a townet attached to a trawl.—Eleven males.

50 mi. W.N.W. of Cleggan Head, Co. Galway, 120 fath., July, 1903, townet on trawl.—Two males and four females.

50 mi. W.N.W. of Slyne Head, 112 fath., August, 1904, townets on trawl.—One female.

30 mi. W.N.W. of Cleggan Head, Co. Galway, 70 fath., August, 1904, townet at bottom.—Four larvae.

Porcupine Bank, lat. $53^{\circ} 1' N.$, long. $14^{\circ} 34' W.$, 293 fath., May, 1905, townet on trawl.—One male and three larvae.

Distribution.—The occurrence of this species at so great a depth as 293 fathoms is noteworthy, and I am not aware that it has ever before been recorded from a greater depth than 100 fathoms. The specimens taken at 199 and 293 fathoms, which were all males, agreed with specimens found in shallow water, especially in the areolation of the dorsal surface.

GENUS *Caecognathia*, Dollfuss.

Caecognathia stygia (G. O. Sars). ?

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a townet attached to the back of a trawl.—One larval female.

Caecognathia stygia was described by G. O. Sars from specimens taken during the Norwegian North Atlantic Expedition. The present specimen agrees in all respects with Sars' figure of the larva of this species. Larval *Gnathia* of all species are very much alike, though the adults are readily distinguishable, but the species under consideration is one of the very few blind members of the genus, so that the identification of the larva is thus very much facilitated.

Distribution.—This form is only known from great depths in the Arctic Ocean, where the Norwegian North Atlantic expedition obtained the type specimens. The present record, therefore, indicates a considerable southern extension of its geographical range.

FAMILY *AEGIDAE*.*

GENUS *Aega*, Leach.

Aega arctica, Lütken.

HELGA.—50 mi. W.N.W. of Eagle Island, Mayo, 388 fath., August, 1904, dredge.—One.

Distribution.—This is the first record of this species for British and Irish waters. It nowhere appears to be common. Only a single specimen is known from Norway. It has been obtained off Greenland and Iceland, and has therefore, up till the present been considered essentially an arctic form.

Aega crenulata, Lütken.

HELGA.—30 mi. N. by W. of Eagle Island, 242 fath., February, 1905, dredge.—One.

Distribution.—This species has only once previously been recorded from British waters, namely, by Matthews, for a specimen procured off Aberdeen. It is known from Norway, Iceland, and Greenland, and is, therefore, essentially an Arctic form. Its occurrence off the west coast of Ireland indicates a considerable southern extension of its range.

Aega ventrosa, M. Sars.

HELGA.—48 mi. W.N.W. of Tearaght, Co. Kerry, November, 1904, 337 fath., townet on trawl.—One.

50 mi. W.N.W. of Tearaght, Co. Kerry, February, 1905, 350 fath., townet on trawl.—One.

Distribution.—Norman, in his recent summary of the British (including Irish) members of this genus, gives only one locality in the British area at which this species has been taken, namely, to the west of the Shetlands, by the *Porcupine* in 1869. The present records therefore indicate a considerable southerly range in its geographical distribution. It is known from Norway, Sweden, and Greenland, in depths from 250-300 fath.

* *Rocinela Dumerilii*, see p. 80.

FAMILY CIROLANIDAE.

GENUS *Cirolana*, Leach.*Cirolana borealis*, Lilljeborg.

HELGA.—80 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1901, 74 fath., dredge.—One.

60 mi. W. of Achill Head, August, 1901, 199 fath., townet on trawl.—Thirteen, small.

50 mi. W.N.W. of Cleggan Head, Co. Galway, May, 1904, 120 fath., townet on trawl.—One.

81 mi. W. $\frac{1}{2}$ N. of Eagle Island, Co. Mayo, August, 1904, 220 fath., townet on trawl.—One.

50 mi. W.N.W. of Slyne Head, 112 fath., August, 1904, townets on trawl.—Two.

80 mi., same course, same date, 180 fath., townet on trawl.—Three.

Distribution.—This species has a very extensive geographical distribution. It is known from both sides of the Atlantic, as well as from the Mediterranean. Its vertical range is very great also, extending from low water mark (see p. 43) to 800 fathoms.

Cirolana Hanseni, J. Bonnier.

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, townet on trawl.—One.

77 mi. W. of Achill Head, 382 fath., August, 1901, townet on trawl.—Six.

Distribution.—Norman has recently recorded this species from three places, all near to each other, to the N.W. of the Butt of Lewis, Scotland. These are the only hitherto known British localities. Bonnier's specimen was taken in the Bay of Biscay. The present records, therefore, from an intermediate station, fill up to some extent the gap which exists in its known geographical range.

GENUS *Eurydice*, Leach.*Eurydice Grimaldii*, Dollfus.*E. elegantula*, Hansen.

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, February, 1903, 320 fath., townet on trawl.—Two.

54 mi. W. of Eagle Is., Co. Mayo, 220 fath., August, 1904, townet at 220 fath.—One.

54 mi. W.N.W. of Tearaght, Co. Kerry, 454 fath., November, 1904, townet on dredge.—One.

50 mi. W. by N. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—One.

Porcupine Bank, Lat. $53^{\circ} 25' N.$, Long. $13^{\circ} 17' W.$, 116 fath., May, 1905, coarse townet at surface.—One.

Same station, coarse townet at bottom.—One.

Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, coarse townet at surface.—One.

Distribution.—Walker records this species from 14-16 fath., in Killybegs Harbour, Co. Donegal. It is also known from the west of Scotland, Lat. 58° - $60^{\circ} N.$, Long. 5° - $14^{\circ} W.$, and from off Cadiz in 327 fath. of water.

Eurydice truncata (Norman).

HELGA.— $11\frac{1}{2}$ mi. W. of Achill Head, May, 1904, coarse townet at 15 fath.—Five.

10 mi. off Tearaght, Co. Kerry, November, 1904, coarse townet at surface.—Nine.

Distribution.—The records of this species are enumerated on p. 45. It would seem to be quite a common species on the west coast of Ireland.

FAMILY SPHAEROMIDAE.

GENUS **Cymodoce**, Leach.

Cymodoce granulatum, M.-Ed.

HELGA.—30 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1901, 74 fath., townet on dredge.—Five, females.

40 mi. W.N.W. of Cleggan Head, Co. Galway, November, 1904, 74 fath., from a bored limestone boulder brought up by the dredge.—Seven males and three females.

20 mi. N. by W. of Eagle Island, Co. Mayo, November, 1904, 72 fath., from bored limestone.—One male and two females.

Distribution.—This species would appear to be rarer than *C. truncata*. It is now added to the British and Irish list, having previously only been taken in the Mediterranean.

FAMILY ANCINIIDAE.

GENUS *Bathycopea*, Tattersall.*Bathycopea typhlops*, Tattersall.

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a tow-net attached to the back of a trawl.—Two females.

77 mi. W. of Achill Head, 382 fath., August, 1901, tow-net on trawl.—Two.

50 mi. W.N.W. of Tearaght, Co. Kerry, 320 fath., February and August, 1903.—Six males and females.

54 mi. W.N.W. of Tearaght, Co. Kerry, 454 fath., November, 1904, tow-net on trawl.—Three.

50 mi. W. by N. of Tearaght, Co. Kerry, 360 fath., May, 1905, tow-net on trawl.—One.

Distribution.—These are the only records known for this species. The bottom in all cases consisted of fine sand.

It is to be regretted that the locality of *Ancinus depressus*, Leach, is unknown. It would have been interesting to have compared the habitats of the two forms.

The *Serolidæ*, the nearest allies to this species, save *A. depressus*, are all but one (*S. carinata*) southern hemisphere forms. They are confined for the most part to the Antarctic area, and those species which occur nearer the tropics are all found in deep water. It is, therefore, decidedly interesting to record a very closely allied form from the northern hemisphere.

TRIBE VALVIFERA.

FAMILY IDOTEIDAE.

GENUS *Idotea*, Fabricius.*Idotea metallica*, Bosc.

HELGA.—30 mi. W.N.W. of Tearaght, Co. Kerry, August, 1903, from floating colonies of *Lepas fascicularis*.—One female, 19 mm.

40 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1903, same habitat.—One, female, 10 mm.

For some notes on this species with reference to its confusion with *I. emarginata*, see p. 50. The colour of the above two specimens was a dark steel blue.

Distribution.—See p. 50.

Idotea sp.

HELGA.—2½ mi. E. of Clare Island Light, 20 fath., July, 1901, mid-water townet, 10 fath.—One, 2 mm.

50 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, 120 fath., townet on trawl.—One, 2 mm.

Both of these specimens, which are referable to the same species, are immature, and their specific identity is a matter of some doubt.

FAMILY ARCTURIDAE.

GENUS *Astacilla*, Cordiner.*Astacilla longicornis* (Sowerby).

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, townets on trawl.—One large female, 22 mm., and several young of both sexes.

50 mi. N.W. by W. of Cleggan Head, Co. Galway, September, 1901, 120 fath., Agassiz trawl.—Six, females.

20 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1902, 72 fath., dredge.—Two females, 22 mm., and several young.

Porcupine Bank, 135 fath., August, 1904, townet on trawl.—One.

Also taken in a trawl off Dungarvan, 32 fath., March, 1904.

Porcupine Bank, Lat. 53° 12' N., Long. 13° 57' W., 93 fath., May, 1905, townet on dredge.—One.

50 mi. W. by N. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—One.

The changes which this species undergoes during the growth to the full adult form render the identification of small specimens exceedingly difficult.

In small specimens, 4 mm. in length, the middle segment of the mesosome is only equal to the preceding part of the body, whereas in full grown individuals it is about twice as long. Moreover, the first joint of the flagellum of the inferior antenna is scarcely equal in length to the remaining joints combined, and bears only one olfactory filament.

In larger specimens, from 6-8 mm., the middle segment of the mesosome has become proportionally longer, and is now about one and a half times as long as the preceding part of the body. The first joint of the flagellum of the inferior antenna has increased in like manner, but is not yet twice as long as the remaining joints combined. The number of olfactory filaments on the superior antenna is now five.

Full-grown specimens agree very well with the diagnoses given in Sars' *Crustacea of Norway*.

Sars gives the length of the adult female as 20 mm., and males half that size. Three females in the present collection measured 22 mm. in length, while one male was at least 12 mm. Males of 10 mm. have the flagellum of the inferior antenna exactly as in Bate and Westwood's figure of *A. gracilis*, which is now regarded as the male of *A. longicornis*. Males of 12 mm., however, agree with the definition of the species given by Sars.

Distribution.—This species is commonly distributed in shallow water round the shores of the British Isles and of Norway. It is also recorded from the Kattegat and Iceland.

No specimens have previously been recorded from so great a depth as 199 fathoms, but the examples noted above from this depth could not be distinguished from specimens taken in shallower water.

***Astacilla intermedia* (Goodsir).**

A. affinis, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., townet on trawl.—One.

50 mi. W.N.W. of Cleggan Head, Co. Galway, September, 1901, 120 fath., Agassiz trawl.—One.

50 mi. W.N.W. of Cleggan Head, Co. Galway, July and August, 1903, and May, 1904, 120 fath., townets on trawl.—Several.

80 mi. W.N.W. of Cleggan, Co. Galway, 185 fath., May, 1905, townet on trawl.—One.

Dr. Norman has recently stated that Sars' *A. affinis* is identical with the earlier described *A. intermedia* of Goodsir, and I here follow his lead. The present examples, which I refer with some doubt to this species, agree in the main with Sars' diagnoses, except that the flagellum of the superior antenna is only as long as, instead of twice as long as, the two preceding joints.

Distribution.—This species was first recorded by Goodsir from the Firth of Forth. Norman has recently recorded it from Durham and S.W. Ireland, while Dr. Scott notes it from Fair Island between Orkney and Shetland.

At the last of the above localities, off Cleggan Head, Co. Galway, this species would seem to be by no means rare.

GENUS *Arcturella*, G. O. Sars.*Arcturella dilatata*, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, Co. Mayo, August, 1901, 199 fath., townet on trawl.—Six females and seven males.

The seven male examples which I have referred to this species are very much more tubercular than Sars' figures would seem to indicate. They have the middle segment of the body covered by regularly arranged tubercles very much like those in *Astacilla granulata*, only not so numerous. I at first thought they were *Astacilla granulata*, but they are true *Arcturella*, as evidenced by the structure of the maxillipedes, first legs and antennae. This fact, coupled with the circumstance that they were all males, and were found in company with *A. dilatata* females, has led me to regard them as the males of the latter species rather than describe them as a new species. They only measure 3 mm. in length.

Distribution.—This species has a rather extended distribution in moderately shallow water, being known from Norway, the Kattegat, British Isles, and the Mediterranean. It was first recorded for Britain by Dr. Robertson, who found it at 20 fath., near the Isle of Arran, Firth of Clyde. Dr. Scott has recently recorded it from Fair Island, between Orkney and Shetland. These are the only two records from British waters, but the species was obtained as far back as 1885 by the Royal Irish Academy Expedition of that year. The exact locality is not available. The species does not seem to have been previously recorded from so great a depth as 199 fathoms.

TRIBE ASELLOTA.

FAMILY IANIRIDAE.

GENUS *Ianira*, Leach.*Ianira maculosa*, Leach.

HELGA.—60 mi. W. of Achill Head, Co. Mayo, August, 1901, 199 fath., townets on trawl.—Several.

20 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1902, 72 fath., townet on trawl.—One.

50 mi. W.N.W. of Cleggan Head, Co. Galway, July and August, 1903, and May, 1904, 120 fath., townets on trawl.—Several.

Off Rathlin Island, Co. Antrim, May, 1904, 115 fath., townets on dredge.—Five.

81 mi. W. $\frac{1}{2}$ N. of Eagle Island, Co. Mayo, August, 1904, 220 fath., townets on trawl and dredge.—Two.

50 mi. W.N.W. of Eagle Island, Co. Mayo, August, 1904, 388 fath., dredge.—One.

50 mi. W.N.W. of Slyne Head, Co. Galway, 112 fath., August, 1904, trawl.—One.

33 mi. W. $\frac{1}{4}$ S. of Tearaght, Co. Kerry, 129 fath., November, 1904, trawl and townets on trawl.—Two.

Dingle Bay, 26 fath., March, 1904, townets on trawl.—One.

80 mi. W.N.W. of Cleggan Tower, Co. Galway, 185 fath., May, 1905, townet on trawl.—One.

50 mi. W. by N. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—Three.

Porcupine Bank, Lat. $53^{\circ} 20' N.$, Long. $13^{\circ} W.$, 164 fath., May, 1905, townet on trawl.—Two.

Distribution.—The species is quite a common one round our coasts and the coasts of Europe. I am not aware that it has previously been recorded from a depth of over 200 fathoms.

GENUS *Ianiropsis*, G. O. Sars.

Ianiropsis breviremis, G. O. Sars.

HELGA.—70 mi. S.W. of Fastnet, 70 fath., August, 1903, Garstang net, 20 fath.—One, 1 mm.

The single small example which I have referred to this species is evidently immature. The characters of the uropods, however, point to its identity with the *Ianiropsis breviremis* of Sars. The eyes present rather a peculiar appearance, due, no doubt, to immaturity. The full amount of pigment characteristic of the adult has not yet been developed. In consequence the true visual elements are not masked, and are seen to the number of eleven, grouped together to form the eye.

Distribution.—This species was first recorded for the British and Irish area by Walker, who took it at Valencia on the shore. It has since been recorded by the same author from the Liverpool Bay area. Outside Britain it is only known from the coasts of Norway and Sweden.

The species has up till now only been met with in littoral waters, hence it is somewhat surprising to find it 70 mi. from land. Its ally, *Ianira maculosa*, has, however, quite as wide a distribution, and there is nothing to suppose that this species, when more fully known, may not have a similarly wide range.

FAMILY MUNNIDAE.

GENUS *Munna*, Boeck*Munna Kröyeri*, Goodsir.

HELGA.—Off Rathlin Island, Co. Antrim, May, 1904, 115 fath., townet on dredge.—Two.

Distribution.—See p. 52. It has not previously been recorded from depths of over 100 fathoms.

Munna limicola, G. O. Sars.

HELGA.—Porcupine Bank, Lat. $53^{\circ} 1' N.$, Long. $14^{\circ} 34' W.$, 293 fath., May, 1905, townet on trawl.—Three.

Distribution.—This species has not previously been taken outside Norwegian waters, where it occurs rather frequently in from 60 to 300 fathoms. Its geographical range is thus considerably extended by its occurrence on the Porcupine Bank.

GENUS *Paramunna*, G. O. Sars.*Paramunna bilobata*, G. O. Sars.

HELGA.—50 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, 120 fath., townet on trawl.—Two.

Distribution.—This species was first recorded from British waters by Norman in 1894, from specimens obtained at Cumbræ, Firth of Clyde, 1888. Previous to this it had only been known from Norway, but Scott has since recorded it from the Firth of Forth and the Firth of Clyde. These records, together with the present one, considerably extend the geographical range of the species.

The depth, 120 fath., at which the above example was taken, is the greatest as yet known for the species, Sars finding it commonly at depths of 20-40 fath., more rarely as deep as 100 fath. It is interesting to note Scott's record of this species from the stomachs of Haddock (19th Report Fishery Board of Scotland, Pt. III., 1900).

GENUS *Pleurogonium*, G. O. Sars.*Pleurogonium inerme*, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a tow-net attached to the back of a trawl.—Two males.

Distribution.—This species appears to be nowhere very commonly found. Sars has taken it sparingly off the coast of Norway in depths of from 60-150 fath., and it has also been recorded from the Kattegat by Meinert. Dr. Robertson dredged it at Cumbrae, Firth of Clyde, while Dr. Scott records its capture from the Firth of Forth, Moray Firth, and from 45 fathoms off Aberdeen.

It has not been as yet found off the English coast, and the present record is the first from Irish waters.

GENUS *Metamunna*, Tattersall.*Metamunna typica*, Tattersall.

HELGA.—50 mi. W.N.W. of Cleggan Head, Co. Galway, 120 fath., July, 1903, tow-net on trawl.—One female.

Porcupine Bank, Lat. 53° 20' N., Long. 13° W., 164 fath., May, 1905, tow-net on trawl.—One.

Distribution.—So far only known from the west coast of Ireland, this species has its nearest allies in forms found off Norway and Scotland.

FAMILY *DESMOSOMIDAE*.GENUS *Desmosoma*, G. O. Sars.*Desmosoma lineare*, G. O. Sars.

HELGA.—77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, tow-net on dredge.—One.

Distribution.—Previous to the above record, only known from the coasts of Norway in 30-100 fath. Its geographical distribution and vertical range are both, therefore, considerably extended by its occurrence off the west coast of Ireland.

GENUS *Ischnosoma*, G. O. Sars.*Ischnosoma bispinosum*, G. O. Sars.

HELGA.—77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, tow-net on dredge.—One.

Distribution.—Norway generally, from 50 to 250 fath., and the Skagerack. Now recorded from the British and Irish area for the first time. Lo Bianco has also recorded it from the Mediterranean.

Ischnosoma Greeni, Tattersall.

HELGA.—77 mi. W. of Achill Head, 382 fath., August, 1901, townet on trawl.—Three.

60 mi. W. of Achill Head, 199 fath., August, 1901, washed from sand brought up in a townet attached to trawl.—One.

Distribution.—As yet only known from the above records.

The genus has a very wide geographical and vertical distribution, being known from all the oceans at depths extending to 2,000 fathoms. The North Atlantic Ocean claims four of the species, *I. bispinosum*, *I. quadrispinosum*, *I. spinosum* and *I. Greeni*, the first two off the coast of Norway, the third off the Azores, and the last off the west coast of Ireland.

GENUS **Eugerdia**, Meinert.**Eugerdia tenuimana**, G. O. Sars.*

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in a townet attached to trawl.—Three males.

The three male specimens captured were all more or less badly damaged, but as far as their condition permits examination, agree well with Sars' description.

Distribution.—This species has quite recently been added to the British and Irish list by Dr. Scott from specimens captured at 150 fath., half way between the Orkneys and Norway, in the course of the International investigation. The bottom townet on that occasion came up with a considerable quantity of sand in it, which on being sifted yielded this species amongst many others, either very rare or new to our fauna. The present specimens were likewise washed from sand brought up in a townet attached to the hack of a trawl.

Besides the two British records mentioned above this species is only known, rather sparingly, from the coasts of Norway and from the Mediterranean, where Lo Bianco has recently taken it.

FAMILY **MUNNOPSIDAE**.†GENUS **Munnopsis**, M. Sars.**Munnopsis oceanica**, Tattersall.

HELGA.—40 mi. N. by W. of Eagle Island, Co. Mayo, August, 1904, large townet working at 750 fath., and thence to the surface.—One male, 7 mm.

50 mi., same course, May, 1905, Petersen trawl at 1,150 fath.—One.

* See also p. 81.

† *Pseudarachna hirsuta*, see p. 81.

Distribution.—This species is as yet only known from the above record. Like its congeners, *M. Murrayi* and *M. longicornis*, it is oceanic in habitat. It is probably confined to the deeper waters of the ocean.

Munnopsis Murrayi, Walker.

Pl. V., Fig. 8.

HELGA.—50 mi. N. by W. of Eagle Island, Co. Mayo, August, 1904, 1,000 fath., large townet fishing at 1,000 fath., and thence to the surface.—Two females, 7 mm.

40 mi., same course, 670 fath., November, 1904, same net worked at 600 fath., and thence to the surface.—One, 7 mm., and two fragments.

54 mi. W.N.W. of Tearaght, Co. Kerry, 454 fath., November, 1904, same net at 350 fath.—One, 7 mm.

Same place, February, 1905, townet on trawl.—Two, 7 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 670 fath., February, 1905, townet at 630 fath.—Two.

Outside Porcupine Bank, 860 fath., May, 1905, Petersen trawl at ca. 700 fath.—Fourteen.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Five.

I have given reasons (p. 24) for the retention of this species in the genus *Munnopsis* at least for the present. A figure of the mandible of *M. Murrayi* (Pl. V., Fig. 8) is given for comparison with that of *M. oceanica*. The present examples agree well with Walker's descriptions, as far as their very damaged condition will allow. The sexual differences could not be made out owing to the state of the specimens.

Distribution.—This species has been recently described by Walker from specimens taken by the *Oceana* in deep water off the west coast of Ireland in November, 1898. It is one of the few truly oceanic Isopods, and though pelagic in habitat it would seem to be confined to the deeper waters of the ocean. It is at present only known from the west coast of Ireland.

GENUS Munnopsoides, Tattersall.

Munnopsoides Beddardi, Tattersall.

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in a townet attached to trawl.—Two.

77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, townet on dredge.—Five.

Distribution.—As yet only known from the above records from the west coast of Ireland. The only other member of the genus, *M. australis*, was taken by the *Challenger* near Kerguelen, in the Southern Ocean. The geographical range of the genus is therefore very considerable.

GENUS *Ilyarachna*, G. O. Sars.

Ilyarachna Plunketti, Tattersall.

HELGA.—60 mi. W. of Achill Head, Co. Mayo, 199 fath., August, 1901, washed from sand brought up in a townet attached to trawl.—One hundred.

77 mi. W. of Achill Head, 382 fath., August, 1901, townet on dredge.—Six.

81 mi. W., $\frac{1}{2}$ N. of Eagle Island, Co. Mayo, 220 fath., August, 1904, townets on trawl.—One.

48 mi. W.N.W. of Tearaght, Co. Kerry, 337 fath., November, 1904, townet on trawl.—One.

54 mi. same course, date and net, 454 fath.—Two.

Distribution.—The above records are all that are at present known for the species.

This appears to be the first record of any member of the genus *Ilyarachna* for British waters, though three species are known from the coast of Norway and the Arctic Seas. A fourth species, *I. polita*, has been described from the Bay of Biscay by Bonnier, while Beddard described *I. quadrispinosum* from the *Challenger* collections. The latter species belongs to the Southern ocean, but all the remaining species are N. Atlantic forms.

GENUS *Eurycope*, G. O. Sars.*

Eurycope phallangium, G. O. Sars.

HELGA.—Porcupine Bank, Lat. 53° 1' N., Long. 14° 34' W., 293 fath., May, 1905, townet on trawl.—One.

Distribution.—This species has only been twice recorded from British and Irish waters, Scott having noted it from the Firth of Forth and Loch Fyne. It is very common off the Norwegian coast in 50 to 300 fathoms, and has also been taken in the Skagerack.

Eurycope latirostris, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in townet attached to back of trawl.—Two hundred and fifty.

Porcupine Bank, Lat. 53° 1' N., Long. 14° 34' W., 293 fath., May, 1905, townet on trawl.—One.

* *Eurycope mutica*, see p. 82.

All the specimens were damaged, and for the most part mere legless hulls. The identification, therefore, rests on the body only, but the agreement is so close that there is no doubt that they belong to this species.

Distribution.—This species is recorded from British waters for the first time. Previously it had only been found by Sars in 150-200 fath. off Norway. Its geographical range is thus greatly extended.

Eurycope megalura, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in tow-net attached to trawl.—Forty-nine.

Unfortunately all the specimens taken came up as bare hulls only, all the appendages of the anterior part of the body having been lost.

Distribution.—This species was previously only known from the coasts of Norway, where Sars had taken it at Hardanger and Stavanger Fjords in depths varying from 150 to 200 fath. It is now for the first time added to the British and Irish fauna.

Eurycope producta, G. O. Sars.

HELGA.—77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, tow-net on dredge.—Sixteen.

Distribution.—Not previously recorded out of Norway, this species is now added to the British and Irish list.

Eurycope longipe Tattersall.

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, 350 fath., February, 1905, tow-net on trawl.—Six.

54 mi. W.N.W. of Tearaght, Co. Kerry, 454 fath., November, 1904, tow-net on dredge.—One.

These are as yet the only known localities for this species. Like its near ally, *E. gigantea*, it would appear to be a deep water form.

GENUS *Lipomera*, Tattersall.

***Lipomera lamellata*, Tattersall.**

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in tow-net attached to trawl.—Eleven, 1.25 mm.

Distribution.—This is as yet the only known locality for the species.

TRIBE EPICARIDA.

FAMILY BOPYRIDAE.

GENUS *Pleurocryptella*, Bonnier.*Pleurocryptella formosa* (Giard and Bonnier).

HELGA.—West of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $14^{\circ} 50' W.$, 500 fath., May, 1905, trawl.—Two, from *Ptychogaster formosus*, A. M.-Ed.

Distribution.—The type and only previously known specimen of this species was found on *Ptychogaster formosus* dredged by the *Talisman* in 450 fathoms near the Canary Islands.

FAMILY DAJIDAE.

GENUS *Aspidophryxus*, G. O. Sars.*Aspidophryxus peltatus*, G. O. Sars.*

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., from the peduncle of the left antennule of *Mysidopsis didelphys*.—One.

50 mi. W.N.W. of Slyne Head, Co. Galway, August, 1904, 112 fath., townet on trawl, from the dorsal surface of *Mysidopsis didephys*.—One.

This species has only once previously been taken on *Mysidopsis didelphys*, Sars, curiously enough, having found a specimen attached exactly as in the first of the above records, to the basal joint of the peduncle of the left antennule.

Distribution.—Scott has recorded this species from deep water to the east of Arran, Firth of Clyde, and the Upper Loch Fyne, the hosts being *Erythrope serrata* and *E. elegans*. This is the only record of the species from British and Irish waters previous to the present one. It is not uncommonly met with off the coasts of Norway, the only other known locality for this form.

GENUS *Notophryxus*, G. O. Sars.*Notophryxus* sp.

HELGA.—50 mi. W.N.W. of Tearaght, Co. Kerry, February, 1905, 350 fath., townet on trawl.—One.

The specimen was found attached to the outside of the brood pouch of *Pseudomma calloptera*. It was only a very young stage, and could not be referred definitely to any species. It is probably an example of *N. clypeatus*, Sars, which is known from *Pseudomma roseum*.

* See also p. 82.

GENUS *Heterophryxus*, G. O. Sars.*Heterophryxus appendiculatus*, G. O. Sars.

Pl. XI., Figs. 1-4.

Locality.—Latitude, $47^{\circ} 14'$ N., longitude $7^{\circ} 58'$ W., July, 1900. One specimen free in a bottle which contained *Euphausia Mülleri** taken at the above position in the Bay of Biscay, in a townet hauled from 25 fath. to the surface, by Dr. Fowler.

Sars' example of this species, on which he founded the genus, was taken from the back of the carapace of *Euphausia pellucida*. The present example was not found attached to any particular host, but free in the bottom of a bottle containing only *Euphausia Mülleri* and some larval Euphausians. It is, therefore, practically certain that it came from the same host as Sars' specimen.

The individual examined by Sars was already mounted on a slide when it reached his hands, so that he was unable to examine it as closely as he desired. I am not able to add very much to his description, but a few points are worthy of note.

The fifth pair of feet in the female differ remarkably from the remaining four. Instead of being, like the latter, imperfectly developed, short, blunt appendages on the lateral edges of the body, they project out behind as long and prominent appendages consisting of a basal part and a bifurcate extremity. These appendages (Pl. XI., Figs. 1-2) appear in the present example to have the basal part relatively longer and more slender than Sars' figure would indicate. There would seem to be a joint just where the bifurcate extremity joins the basal part, while the outer of the two forks is also articulated to the inner one near the junction with the main part of the appendage.

The male was attached to the female by a narrow twisted fleshy cord (Pl. XI., Fig. 2) just as is described for *Aspidophryxus peltatus*. Messrs. Giard and Bonnier are of the opinion that this cord, in the latter species, belongs to a parasitical copepod found occasionally on the same host as the Epicarid above mentioned. I am, however, entirely of the opinion expressed by Sars, that this cord is part of the genital apparatus of the female, since in the present specimen of *Heterophryxus appendiculatus*, the male was distinctly found clinging to it.

On detaching the male two well-developed overlapping plates (Pl. XI., Fig. 2) are seen to project posteriorly from the under side of the body between the large fifth pair of legs.

* *E. Mülleri*, Claus, (= *Thysanopoda bidentata*, G. O. Sars) is one of the species into which Hansen (*Bull. Mus. Oceanograph. Monaco*, No. 42, 1905, p. 11) has shown the *E. pellucida* of Sars' Challenger Report to be divisible. The host of the type specimen of *Heterophryxus*, having been taken off the Cape Verde Islands, may probably have been *E. Mülleri*.

The male (Pl. XI., Fig. 3) presents an appearance on the whole agreeing with that of *Aspidophryxus peltatus*, except that the metasome shows absolutely no traces of segmentation. No uropods could, however, be detected under a high power of the microscope. The legs (Pl. XI., Fig. 4) agree exactly with those figured by Sars for the last-named species. The antennae appear to be rather rudimentary compared with those of other genera of the family.

Distribution.—The type specimen was taken during the *Challenger* expedition attached to an *Euphausia pellucida* captured off the Cape Verde Islands. Till quite recently this was the only known specimen. Lo Bianco has, however, recorded numerous examples from the same host caught in the Mediterranean, while Dr. Fowler's specimen comes from the Bay of Biscay. The distribution of the form is therefore subtropical, East Atlantic and the Mediterranean.

FAMILY CRYPTONISCIDAE.

GENUS *Asconiscus*, G. O. Sars.

Asconiscus simplex, G. O. Sars.

HELGA.—60 mi. W. of Achill Head, August, 1901, 199 fath., washed from sand brought up in tow-net attached to the back of trawl.—One male, 1.5 mm.

The single male example agreed in all respects, as far as could be seen, with Sars' figures. It was not found associated with any host, but the only known host of the species, *Boreomysis arctica*, occurred in the same haul.

Distribution.—This is the first occurrence of the species in British and Irish waters, and, indeed, the first record out of Norway, its only previously known locality. A considerable extension of its geographical distribution is therefore made by its capture off the west coast of Ireland.

FAMILY BOPYRIDAE.

GENUS *Scyracepon*, Tattersall.

Scyracepon tuberculosa, Tattersall.

HELGA.—48 mi. W.N.W. of Tearaght, Co. Kerry, 337 fath., November, 1904, trawl.—Four adult and one phryxoid stage from *Scyramathia Carpenteri*.

Distribution.—This is as yet the only known record for the species.

Epicarid larvae.

Epicarid larvae belonging to both the *Bopyridae* and the *Cryptoniscidae* are of frequent occurrence in the townets taken at off-shore stations off the west coast of Ireland.

BOPYRIDAE.

Larvae belonging to this family occurred at the following stations. They are nearly all referable to *Microniscus calani*.

HELGA.—40 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1901, 78 fath., townet.—One.

10 mi. W. by S. of Cleggan Head, Co. Galway, July, 1901, 60 fath., townet.—Two.

2½ mi. N. ¼ W. of Rinvyle Point, Co. Galway, July, 1901, 24 fath., townet.—Two.

2½ mi. N. ¼ W. of Rinvyle Point, Co. Galway, August, 1901, 25 fath., townet.—One (blind).

10 mi. W.N.W. of Cleggan Head, Co. Galway, September, 1902, townet at surface.—Three.

30 mi. W.N.W. of Cleggan Head, Co. Galway, September, 1902, townet at surface.—One.

30 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, townet at surface.—One free and two on Copepods.

20 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, townet at 60 fath.—Three.

10 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1903, townet at 25 fath.—Several.

The larva taken at the fifth of the above stations was blind. One of those taken at the ninth station which otherwise agreed well enough with *M. calani*, had the eyes very black and the uropods strongly setose, each branch carrying in addition to numerous small setae, one very long and strong seta. The remainder all agreed fairly well with *M. calani*.

CRYPTONISCIDAE.

Larvae belonging to this family occurred at the following stations:—

HELGA.—10 mi. W. by S. of Cleggan Head, Co. Galway, July, 1901, 60 fath., townet.—Three.

2½ mi. N. ¼ W. of Rinvyle Point, Co. Galway, July, 1901, 24 fath., townet.—Three.

Same course, date and depth, townet at surface.—One.

30 mi. W.N.W. of Cleggan Head, Co. Galway, August, 1901, 74 fath., townet on dredge.—Three.

Same place and date, townet at bottom, 74 fath.—One.

40 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, townet at 90 fath.—One.

20 mi. W.N.W. of Cleggan Head, Co. Galway, July, 1903, townet at 30 fath.—Three.

Same station and date, townet at 60 fath.—One.

All the above Cryptoniscid larvae appear to be identical with *Cryptothir balani*.

iv.—ISOPODA FROM THE EAST COAST OF IRELAND.

The notes which follow must be regarded as an addendum to the preceding parts of the paper, since several of the species here mentioned are not discussed (in relation to their occurrence within the British and Irish area) in the observations offered at pp. 38 and 57. *Eurycope mutica* is an addition to the British and Irish list; *Pseudarachna hirsuta* and *Rocinela Dumerilii* have not previously been recorded from Irish localities; while it may be taken as certain that the list of east coast forms given below leaves much to be desired in the way of completeness.

Rocinela Dumerilii (Lucas).

16½ mi. S.W. of Coningbeg Light, Co. Wexford, 40 fath., May, 1905, townet on trawl.—One, immature.

Distribution.—This species has recently been added to the British and Irish list by Norman for a specimen taken off Plymouth. It is also known from the Mediterranean, and has, apparently, a more southern distribution than *R. damnoniensis*.

Cirolana borealis, Lilljeborg.

Lambay Deep, 39-60 fath., February and July, 1902, January, 1903, and June, 1904.—Six large specimens.

Off S.W. of Isle of Man, 36-39 fath., May, 1905.—One

Eurydice pulchra, Leach.

Skerries Bay, surface, July, 1902, with floating algae.—One.

Idotea baltica (Pallas).

South of Lambay, 10-13 fath., January, 1902.—Three.
Dublin Bay, 4 fath., March, 1904, and February, 1905.—Twenty.

Idotea neglecta, G. O. Sars.

South of Lambay, 10-13 fath., January, 1902.—Two.
Dublin Bay, 4 fath., March, 1904.—Three.

Idotea emarginata (Fabricius).

Dublin Bay, 4 fath., March, 1904.—One.

Idotea linearis (Pennant).

Lambay Deep, 48-60 fath., July, 1902.—One.

Off Clogher Head, July, 1902, 29-36 fath.—One.

Off Dundalk Bay, 14-16 fath., May, 1903, and February, 1905.—One.

Inside Burford Light, Dublin Bay, November, 1903.—One.

Dublin Bay, 4 fath., March, 1904.—One.

Astacilla longicornis (Sowerby).

16 mi. off Clogher, 29-36 fath., 1902.—Three males, 10 mm.

S.W. of Clogher, 12-19 fath., 1902.—One male, 10 mm., and one young.

7 mi. S.E. of Carlingford Bar, 21-23 fath., April, 1903.—One female, 15 mm.

Off Rockabill, 31-35 fath., April, 1903.—One male, 10 mm.

S.W. of Clogher, 7-12 fath., 1903.—One male, 10 mm.

Off Carlingford Lough, 32 fath., February, 1905.—One.

S.W. of Isle of Man, 40 fath., February, 1905.—Nine.

Off S.W. of Isle of Man, 36-39 fath., May, 1905.—One.

Ianira maculosa, Leach.

2 mi. outside Kish Lighthouse, 20-23 fath., April, 1903.—One.

2-8 mi. off Lambay, 21-25 fath., April, 1903.—Several.

14 mi. off Clogher, 29-30 fath., April, 1903.—Seven.

Lambay Deep, 44 fath., June, 1904.—Three.

At each of the above localities the trawl came up full of *Alcyonium digitatum*, and the *Ianira* were in each case found in numbers clinging to the colonies.

Munna Krøyeri, Goodsir.

Lambay Deep, 44 fath., June, 1904.—One.

Pleurogonium rubicundum, G. O. Sars.

Off Clogher Head, 12-14 fath., June, 1904.—Four.

Off S.W. of Isle of Man, 34-37 fath., May, 1905.—Thirty-one.

Eugerdia tenuimana, G. O. Sars.

Off S.W. of Isle of Man, 34-37 fath., May, 1905.—Six.

Pseudarachna hirsuta, G. O. Sars.

Off S.W. of Isle of Man, 34-37 fath., May, 1905.—Six.

Distribution.—This species was added to the British and Irish list by Scott for a single specimen taken in Moray Firth. Otherwise it is only known from the Christiania Fiord, Norway, in about 30 fathoms.

Eurycope mutica, G. O. Sars.

Off S.W. of Isle of Man, 34-37 fath., May, 1905.—Four.

Distribution.—Now recorded for the first time from British and Irish waters. Hitherto it has only been met with in shallow water off the coast of Norway.

Aspidophryxus peltatus, G. O. Sars.

Off S.W. of Isle of Man, 40 fath., February, 1905.—Two, hosts uncertain, but both *Erythropis serrata* and *Mysidopsis didelphys* occurred in the same haul.

V.—SOME NOTES ON THE GEOGRAPHICAL DISTRIBUTION OF BRITISH AND IRISH ISOPODA.

The British and Irish Isopodan fauna appears to be a curious mingling of boreal and southern forms together with a percentage of species as yet only known from our waters. Considering only marine forms and excluding the whole tribe *Oniscoidea*, which only contains one British marine species, *Ligia oceanica*, there are altogether 134 known British and Irish species of Isopoda. Arranged in tribes and compared with a boreal fauna like that of Norway, and a southern fauna like that of the Mediterranean, we get the following result in tabular form:—

Tribes.	Total British and Irish Species.	Total British and Irish Species found in Norway.	Total British and Irish Species found in Mediterranean.	Total Common to all three.
Tanaidacea, . .	27	10	9	4
Parabollifera, . .	39	14	19	7
Valvifera, . .	17	10	8	3
Asellota, . .	32	22	4	3
Epicarida, . .	19	13	3	1
Total, . .	134	69	43	18

That is, out of a total British and Irish species of 134, 69 are found in Norway, 43 in the Mediterranean, while only 18 are common to the fauna of all three regions.

Subtracting from all three totals those species which are common, we get the figures—

116, 51, 25,

or, the British and Irish Isopodan fauna is made up of, roughly, one-half boreal, and one-quarter southern types, and one-quarter representing forms at present only known from British and Irish waters.

An almost precisely similar result is obtained when we consider the British species of *Mysidae* in the same manner. The figures for the *Mysidae* read :—

Total British and Irish.	Total British and Irish known from Norway.	Total British and Irish known from Mediterranean.	Total British and Irish common to all three.
55	29	17	5

Again, subtracting the species that are common to all three faunas, the figures read :—

50, 24, 12,

i.e., the British and Irish *Mysidae* are made up of, roughly, one-quarter southern, one-half boreal and one-quarter of forms not yet known outside our area.

The *Euphausiidae* are not included in the above considerations of the British and Irish Schizopodan fauna for the obvious reason that their active swimming habits and development by pelagic free-swimming larval forms do not allow them to be compared with forms of a bottom haunting mode of life, reproducing by direct development. But taking two groups of Crustacea, as is done above, whose habits are to some extent identical and whose modes of reproduction are essentially the same, it is at least interesting to find that they give practically similar results. It is true that the *Mysidae* have greater powers of locomotion than the Isopoda, and may therefore be expected to be more widely distributed, but the *Mysidae*, though, with the possible exception of *Heteromysis*, none appear to be absolutely repent, are essentially bottom haunting forms rather than permanently pelagic or oceanic, and seem comparable in this respect to the Isopoda. It will be interesting to see whether these results are borne out by the consideration in like manner of the British and Irish Cumacea and Amphipoda, or, indeed, of any other group with comparable habits and life history.

The curious mingling of boreal and southern types in the British and Irish Isopoda is further illustrated when we consider the various families of this group. The whole of the tribe *Asellota* would appear to be an almost purely boreal one, since only four species are known from the Mediterranean, and

three are common to the three faunas. The family *Sphaeromidae*, on the other hand, is entirely unknown in Norwegian and boreal waters generally, though in the Mediterranean it is represented by numerous species. Both groups are well represented in the British and Irish fauna, the former by thirty-two and the latter by seven species.

In the genera of the *Tanaidacea* we may again notice this fact. *Apseudes* has eight species in the Mediterranean and only one in Norway. *Typhlotanais* and *Leptognathia*, on the other hand, have nine and six species, respectively, in Norway, and only one each in the Mediterranean. All three are well represented in our fauna—*Apseudes* by six, *Typhlotanais* by four, and *Leptognathia* by five species, respectively. The following tables, one for each tribe, show the known distribution of all British and Irish marine Isopoda :—

ORDER TANAIDACEA.

	N. B. America.	Greenland.	Spitzbergen and Kara Sea.	Iceland.	Norway.	Sweden.	Denmark.	Belgium.	N. Coast of France.	Bay of Biscay.	Atlantic Coast of Spain and Portugal.	Mediterranean.	Black Sea.
<i>Apseudes taipa</i> ,
" <i>Latreilli</i> ,
" <i>bibernicus</i> ,
" <i>spinosus</i> ,
" <i>simplicirostris</i> ,
" <i>grossimanus</i> ,
<i>Sphyrapus malicollis</i> ,
" <i>tudes</i> ,
<i>Tanais cavolinii</i> ,
" <i>Dulongii</i> ,
<i>Leptochelia Savignii</i> ,
" <i>dubia</i> ,
<i>Alciotana serratuspinosus</i> ,
" <i>laevispinosus</i> ,
<i>Paratanais Batei</i>
<i>Leptognathia longiremis</i> ,
" <i>Lilljeborgi</i> ,
" <i>brevimana</i> ,
" <i>rigida</i> ,
" <i>breviremis</i> ,
<i>Tanaopsia laticaudata</i> ,
<i>Typhlotanais brevicornis</i> ,
" <i>tenacicornis</i> ,
" <i>proctagon</i> ,
" <i>Richardi</i> ,
<i>Strongyliura arctophylax</i> ,
<i>Pseudotanais forcipatus</i> ,

TRIBE *Flabellifera*.

	N. B. America.	Greenland.	Spitzbergen and Kara Sea.	Iceland.	Norway.	Sweden.	Denmark.	Belgium.	N. Coast of France.	Bay of Biscay.	Atlantic Coast of Spain and Portugal.	Mediterranean.	Black Sea.
<i>Anthura gracilis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Calathura brachiata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Paranthura nigropunctata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gastrea maxillaris</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>G. oxyurea</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>G. formica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Caecognathia stygia</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Aega psora</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>ventrosa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>tridens</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Stromii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>rosacea</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>monophthalma</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>crenulata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>arctica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Rocissela damnoniensis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Dumerilii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Sysicenus infelix</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cirolana borealis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Hansenii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>cranchii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Conifera cylindracea</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eurydice pulchra</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>truncata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Grunnaldi</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>spinigera</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>lucerna</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Limoria lignorum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Sphaeroma serratum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>rugicauda</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Sphaeroma Hookeri</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Nema bidentata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cymodoce truncata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>granulatum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Campeopea hirsuta</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Bathycropea typhlops</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Andocera phryodes</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>autilus</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Nereocila neapolitana</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+

TRIBE *Valvifera*.

	N. B. America.	Greenland.	Spitzbergen and Kara Sea.	Iceland.	Norway.	Sweden.	Denmark.	Belgium.	N. Coast of France.	Bay of Biscay.	Atlantic Coast of Spain and Portugal.	Mediterranean.	Black Sea.
<i>Idotea baltica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>granulosa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>neglecta</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>viridis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>pelagica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>emarginata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>metallica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>linearis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Zenobiana prismatica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Stenosioma lanceolatum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>acuminatum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Arcturus hystrix</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Arcturella dilatata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>damnoniensis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Astartella longicorpus</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>intermedia</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Deshayesi</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+

TRIBE *Asellota*

	N. E. America.	Greenland.	Spitzbergen and Kara Sea.	Iceland.	Norway.	Sweden.	Denmark.	Belgium.	N. Coast of France.	Bay of Biscay.	Atlantic Coast of Spain and Portugal.	Mediterranean.	Black Sea.
<i>Iania maculosa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ianiropsis breviremis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Iasra marina</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>nordmanni</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Munna Fabricii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>Kroyeri</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>hmicola</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>Boeckii</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Paramunna bilobata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Metamunna typica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pleurogonium rubicundum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>spinulosissimum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>inermis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Leptaspidea brevipes</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Macrostylis spinifera</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Demosoma lineare</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ischnosoma hispidosum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>Greeni</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Eugerdia tenuimana</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Echinopleura aculeata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Munnopsis oceanica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>Murrayi</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Munnopsoides Beddardi</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ilyarachna Plunketti</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudarachna hiruta</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Buryocope phalangium</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>megalaria</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>latirostris</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>producta</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>longipes</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>mutica</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Lipomera lamellata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+

TRIBE *Epicarida*.

	N. E. America.	Greenland.	Spitzbergen and Kara Sea.	Iceland.	Norway.	Sweden.	Denmark.	Belgium.	N. Coast of France.	Bay of Biscay.	Atlantic Coast of Spain and Portugal.	Mediterranean.	Black Sea.
<i>Bopyrus squillarum</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Bopyroides bipolytes</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Bopyrina viridis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pleurocrypta galathea</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>marginata</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pleurocryptella formosa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Athelges paguri</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Pseudone hydramani</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>adonis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
" <i>confusa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gyge branchialis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Ione thoracicus</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Phryxus abdominalis</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Scyrapocyon tuberculosa</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Aspidophryxus peltatus</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Asconiscus simplex</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Clypeoniscus Hanseni</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cryptothrix balani</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Liriopeis pygmaea</i> , ..	+	+	+	+	+	+	+	+	+	+	+	+	+

It will be seen from these tables that no fewer than twelve species of British and Irish Isopoda are also known from the N.E. coast of America, their distribution having in many cases been traced step by step from Norway to America by way of the Arctic Ocean, e.g., *Calathura brachiata*, *Aega psora*, *Munna Fabricii*, and *Phryxus abdominalis*. On the other hand, the extension to America of such a type as *Leptochelia dubia*, unknown from any waters north of Ireland, but traced all the way from there southward to the Mediterranean and the Azores, would seem to have taken a southern route across the narrow strip of ocean between Senegambia and Brazil, where it is also known, and so up to the N.E. coast of North America. We may here note as of interest that the large family *Cymothoidae*, while represented in the Mediterranean by numerous species and generally distributed in tropical and sub-tropical waters, is entirely unknown from boreal waters, and only three species approach anywhere near to the British and Irish area, *Anilocra asilus* and *A. physodes* having been recorded from the Channel Islands by Koehler and Norman respectively, while *Nerocila neapolitana* has been found by Norman at Plymouth. This is the more remarkable since these Isopods are parasites on fishes, and would thus seem to have ample opportunity for wide and extended distribution.

With regard to the new forms described in Part I., most of them are only specifically distinct from Norwegian or Mediterranean forms. *Munnopsoides Beddardi*, however, has its nearest ally in a species known from the Pacific near Australia, while *Bathycopea typhlops* would appear to be the representative in the northern hemisphere of the essentially southern and Antarctic genus *Serolis*.

EXPLANATION OF PLATES.

PLATE I.

Typhlotanais proctagon, sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " lateral view of anterior end.
 Fig. 3. " cheliped.
 Fig. 4. " second leg.
 Fig. 5. " third leg.
 Fig. 6. " fifth leg.
 Fig. 7. " seventh leg.
 Fig. 8. " seventh leg of another specimen, distal joints enlarged.
 Fig. 9. " inferior antenna.

PLATE II.

Cymodoce truncata (Montagu).

- Fig. 1.—Gravid female, dorsal view.
 Fig. 2. " " superior antenna.
 Fig. 3. " " inferior antenna.
 Fig. 4. " " mandible.
 Fig. 5. " " first maxilla.
 Fig. 6. " " second maxilla.
 Fig. 7. " " maxilliped.
 Fig. 8. " " first leg.
 Fig. 9. " " uropod, ventral view.

PLATE III.

Bathycopea typhlops, gen et sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " inferior antenna.
 Fig. 4. " mandible.
 Fig. 5. " first maxilla.
 Fig. 6. " second maxilla.
 Fig. 7. " maxilliped.
 Fig. 8. " first leg.
 Fig. 9.—Male, second leg.
 Fig. 10.—Female, second leg.
 Fig. 11. " fifth leg.
 Fig. 12.—Male, inner lamella of second pleopod.
 Fig. 13.—Female, epimera of second and third thoracic segments from below showing the ventral prolongation of the anterior edge which is present on all the epimera but the first.

PLATE IV.

Ischnosoma Greeni, sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " first leg.
 Fig. 4. " second leg.
 Fig. 5. " fourth leg.
 Fig. 6. " posterior end of another specimen showing uropods.

PLATE V.

Munnopsis oceanica, sp. n.

- Fig. 1.—Male, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " mandible.
 Fig. 4. " maxilliped.
 Fig. 5. " first leg.
 Fig. 6. " fifth leg.
 Fig. 7. " uropod.

Munnopsis Murrayi, A. O. Walker.

- Fig. 8.—Male, mandible.

PLATE VI.

Munnopsoides Beddardi, gen. et sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " mandible.
 Fig. 4. " first maxilla.
 Fig. 5. " second maxilla.
 Fig. 6. " maxilliped.
 Fig. 7. " first leg.
 Fig. 8. " fifth leg.

PLATE VII.

Ilyarachna Plunketti, sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " inferior antenna, basal joints.
 Fig. 4. " first leg.
 Fig. 5. " second leg.
 Fig. 6. " fifth leg.
 Fig. 7. " seventh leg.
 Fig. 8. " uropod.
 Fig. 9. " operculum.

PLATE VIII.

Lipomera lamellata, gen. et sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " superior antenna and peduncle of inferior antenna.
 Fig. 3. " first maxilla.
 Fig. 4. " second maxilla.
 Fig. 5. " maxilliped.
 Fig. 6. " first leg.
 Fig. 7. " second leg.
 Fig. 8. " fifth leg.
 Fig. 9. " sixth leg.
 Fig. 10. " seventh leg.
 Fig. 11. " uropod, folded as attached to body.
 Fig. 12. " uropod, opened out.
 Fig. 13. " operculum.
 Fig. 14.—Male, operculum.

PLATE IX.

Metamurra typica, sp. n.

- Fig. 1.—Female, dorsal view.
 Fig. 2. " first leg.
 Fig. 3. " uropod.

Apsoudes hibernicus, A. O. Walker.

- Fig. 4.—Female, second leg.
 Fig. 5.—Young specimen, superior antenna.
 Fig. 6. " " inferior antenna.
 Fig. 7. " " cheliped.

Cirolana borealis, Lilljeborg.

- Fig. 8.—Male, stylet of second pleopod.

Tanaopsis laticaudata, G. O. Sars.

- Fig. 9.—Male, superior antenna.
 Fig. 10. " metasome, dorsal view.

Iacra marina (Fabricius).

- Fig. 11.—Male, operculum.

Iacra Nordmanni (Rathke).

- Fig. 12.—Male, operculum.

PLATE X.

Eurycope longipes, sp. n.

- Fig. 1.—Male, dorsal view.
 Fig. 2. " superior antenna.
 Fig. 3. " mandible.
 Fig. 4. " mandibular palp.
 Fig. 5. " maxilliped.
 Fig. 6. " first leg.
 Fig. 7. " uropod.
 Fig. 8. " operculum.

PLATE XI.

Heterophryxus appendiculatus, G. O. Sars

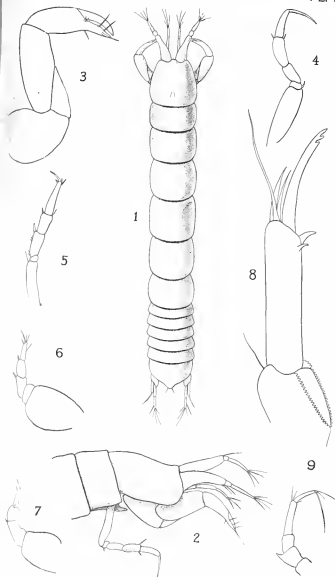
- Fig. 1.—Female, dorsal view.
 Fig. 2. " posterior end after removal of male.
 Fig. 3.—Male, dorsal view.
 Fig. 4. " first leg.

Eurydice truncata (Norman).

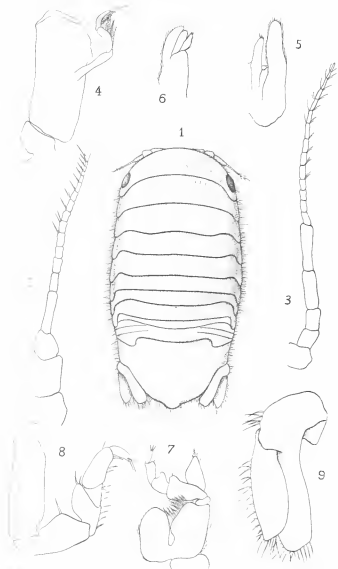
- Fig. 5.—Female, superior antenna.
 Fig. 6.—Young male, superior antenna.
 Fig. 7.—Adult male, superior antenna.
 Fig. 8.—Telson.

Scyraespon tuberculosa, gen. et sp. n.

- Fig. 9.—Female, dorsal view.
 Fig. 10.—Male, dorsal view.
 Fig. 11.—Female, fifth leg.
 Fig. 12.—Male, first leg.

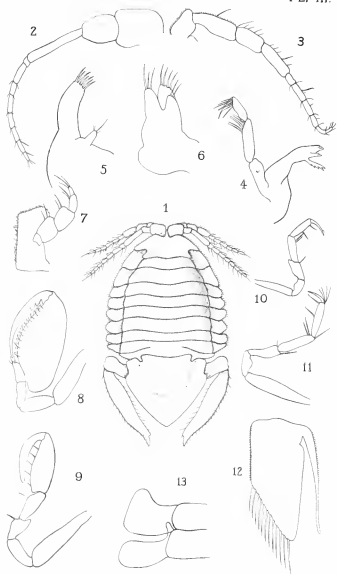


Typhlotanais proctagon.



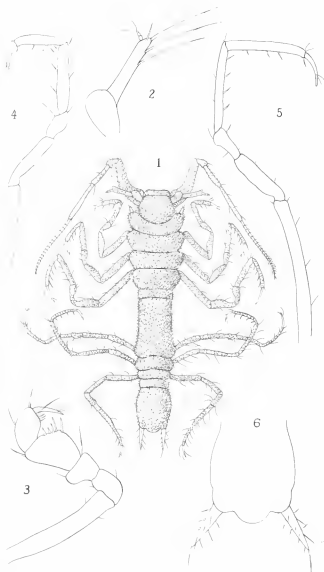
W. T. } del.
G. W. }

Cymodoce truncata



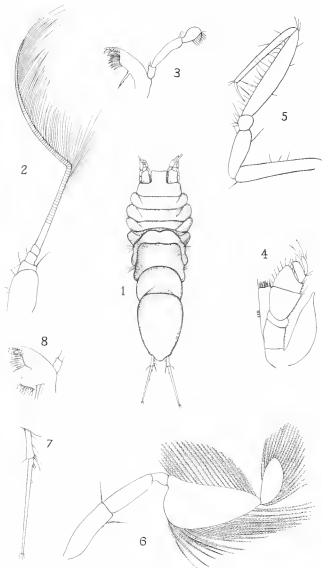
Bathycopea typhlops.

V. M. T. }
G. M. W. } del.



W. B. T. } del.
C. M. W. }

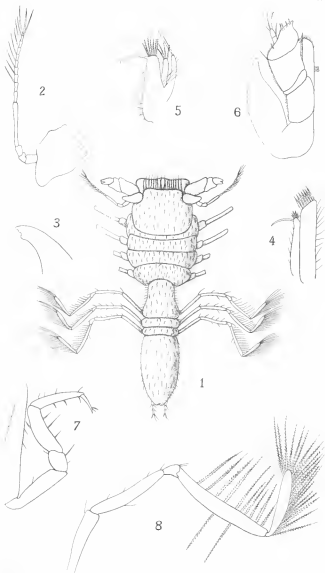
Ischnosoma Greeni.



W. M. T. }
 L. M. W. } del.

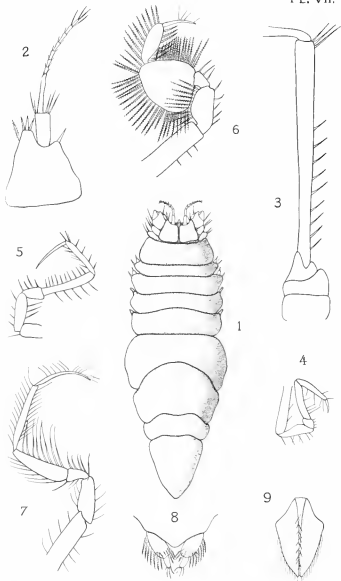
1-7, *Munnopsis oceanica*.

8, *Munnopsis Murrayi*.



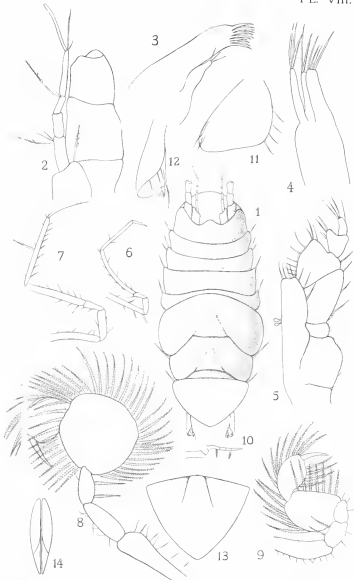
M. T. }
M. W. } del.

Munnopsoides Beddard.

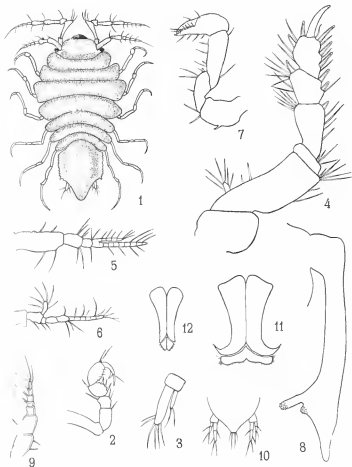


W. M. T. } del
G. M. W. }

Ilyarachna Plunketti.



Lipomera lamellata.



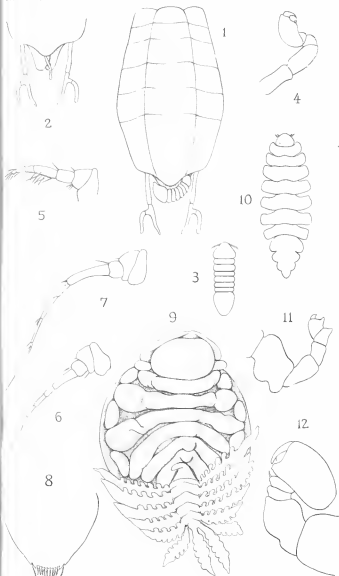
W. N. T. I. d. d.
C. M. W. I.

- 1-5. *Metamunna typica*.
 4-7. *Apseudes hibernica*.
 8. *Cirolana borealis*.
 9, 10. *Tanaopsis laticaudata*.
 11. *laera marina*.
 12. *laera Nordmanni*.



W. M. T. } del.
G. M. W. }

Eurycope longipes.



1-4, *Heterophryxus appendiculatus*.
 5-8, *Eurydice truncata*.
 9-12, *Scyracepon tuberculosa*.

M. T. } del.
 M. W. }



A LIST OF THE MARINE COPEPODA OF IRELAND.

PART I.—LITTORAL FORMS AND FISH PARASITES

BY

JOSEPH PEARSON, B.Sc.

INTRODUCTION.

When working in the Marine Laboratory, Larne Harbour, as Naturalist to the Ulster Fisheries and Biology Association, the writer made out a list of Irish Copepoda in connection with his work at that group. It was suggested by Prof. Gregg Wilson that such a list might be of value to Irish workers if published. The present paper, therefore, is an attempt to bring together all the species of marine Copepoda that have been recorded from Irish waters up to the present time.

It is quite evident from an examination of the literature of Irish Copepoda that the majority of workers have devoted their attention to the pelagic forms. A great deal, therefore, still remains to be done at the bottom forms, and there is little doubt that it will be in this direction that the greatest advance in our knowledge of Irish Copepoda will be made in the future. Similarly, the parasitic and semi-parasitic forms have not been studied as their importance and great interest would have led one to expect. This is especially noteworthy in the case of the fish parasites; and it is astonishing to find that, with one exception, no work on these forms has been published since the publication of Thompson's lists in 1856.

It is intended to include only marine species in the present paper, but four brackish water species have also been included, viz.:—*Cyclops aequoreus*, *Mesochra Lilljeborgi*, *Laophonte subsalsa*, and *Tachidius brevicornis*. These species were not actually found in the sea, but they occurred in brackish pools so near to the sea that it is almost certain that at times the pools were supplied with sea water. It is extremely difficult to draw a definite line of demarcation between the marine and fresh water species of Copepoda, as there are many examples of marine species being found in the brackish waters of estuaries and even in fresh water (e.g., *Dactylopus tiboides*, *Harpacticus fulvus*, &c.).

Fisheries, Ireland, Sci. Invest., 1904, III. [Published, November, 1905.]

In preparing this paper I have mainly adopted the nomenclature given by Giesbrecht^{1,2} and Sars³. In the case of the fish parasites I have followed the classification and synonymy of Basset-Smith⁴.

The first part of this paper will deal with purely littoral species, together with the fish parasites. The pelagic forms will be included in the second part.

I am indebted to Prof. Brady, F.R.S., for allowing me to use his unpublished lists of Copepoda obtained at Larne, and also to Prof. Newton Parker for his kindness in providing me with most of the literature used in the compilation of these lists.

i.—LITTORAL SPECIES.

FAMILY PONTELLIDAE.

GENUS *Parapontella*, Brady, 1878.

Parapontella brevicornis (Lubbock).

Pontella brevicornis, Lubbock, 1857.

Parapontella brevicornis, Brady, 1878.

Westport Bay (7), Zostera beds and surface townet; Clifden Bay (7), Zostera beds; Kinsale Harbour (7), townet; mouth of the Shannon (9); Kenmare Bay (9), townet; Valentia (18), townet; Cleggan (8), "scarce in open sea, plentiful close to shore"; Larne (13), townet.

The vast majority of the Calanoida are pronouncedly pelagic, and the only exception amongst the Irish representatives of this division is the above species, which appears to be a strictly littoral form. It occurs in the townet near shore, and also in tidal pools. Sometimes it is taken in dredged material.

General distribution.—British seas, Mediterranean, Atlantic (50° to 57° N.).

FAMILY HARPACTICIDAE.

GENUS *Misophria*, Boeck, 1864.

Misophria pallida, Boeck.

Misophria pallida, Boeck, 1864.

Donegal (4), washings of Laminaria.

General distribution.—British seas (rare), Mediterranean, Norway.

¹ Giesbrecht.—Fauna und Flora des Golfes von Neapel.

XIX. Monographie, Pelagischen Copepoden, 1892.

XXV. Monographie, Asterocheriden, 1899.

² Giesbrecht and Schmil.—Das Tierreich, Gymnoplea, Berlin, 1898.

³ G. O. Sars.—Crustacea of Norway, Vol. IV. (Calanoida), 1903.

Vol. V. (Harpacticoida [part]), 1908.

⁴ Basset-Smith.—Proc. Zool. Soc., London, 1899, pp. 438-507.

GENUS **Longipedia**, Claus, 1863.[**Longipedia coronata**, Claus.]*Longipedia coronata*, Claus (not Brady), 1863.

The occurrence of this species in Irish waters is doubtful, owing to confusion in identification. Brady's specimens, described under this name in the Monograph of Copepoda, really belong to *Longipedia Scotti* and *Canuella perplexa*.

Longipedia Scotti, Sars.*Longipedia Scotti*, Sars, 1903.*Longipedia coronata*, Brady, Scott (not Claus).

Clifden Bay (7), amongst Laminaria, 4 fms.; Aranmore, tide pools (4); Lough Swilly (4), 2 fms.; ? Gola Islands, Donegal (9) townet; ? Mouth of the Shannon (9) townet; Cleggan (8) townet.

General distribution.—British coasts, N. Atlantic (Norway).

GENUS **Canuella**, Scott, 1893.**Canuella perplexa**, Scott.*Canuella perplexa*, Scott, 1893.*Longipedia coronata*, ♂, Brady, 1878 (not Claus).

? Clifden Bay (7), amongst Laminaria; ? Aranmore (4) tide pools; Lough Swilly (4) 2 fms.; Ballygalley Bay, Co. Antrim (6), 4 fms.

General distribution.—British Seas, Norway.

GENUS **Ectinosoma** Boeck, 1864.**Ectinosoma melaniceps**, Boeck.*Ectinosoma melaniceps*, Boeck, 1864.

Great Isle of Aran (7); Newcastle, Co. Down (5); Dundrum (5).

This species is generally found in weeds and mud near the shore.

General distribution.—N. Atlantic.

Ectinosoma spinipes, Brady.*E. melaniceps*, Brady (not Boeck), 1872.*E. spinipes*, Brady, 1878.

Aranmore (4), tide pool; Lough Swilly (4), 2 fms.; Gola Islands, Donegal (9), townet; Killybegs (9), townet; Kenmare Bay (9); Valentia (18), townet.

General distribution.—British Seas.

Ectinosoma erythrops, Brady.*Ectinosoma erythrops*, Brady, 1878.

Killybegs, Donegal (9), townet.

General distribution.—British Seas.**Ectinosoma Normani**, Scott.*Ectinosoma Normani*, T. & A. Scott, 1896.

Dundrum (5), shore pool.

General distribution.—British Seas, Indian Ocean.**Ectinosoma propinquum**, Scott.*Ectinosoma propinquum*, T. & A. Scott, 1896.

Ballygalley Bay, Co. Antrim (6), 4 fms.

General distribution.—British Seas, Indian Ocean.**Ectinosoma atlanticum** (B. & R.)*Microsetella atlanticum*, Brady and Robertson, 1873.*Ectinosoma atlanticum*, Brady, 1878.*Microsetella brevifida*, Giesbr., 1891.*Microsetella atlanticum*, Giesbr., 1892.

Open sea of S.W. Ireland (4), townet; Kinsale Harbour (4);
 Gola Islands, Donegal (9), townet; Kenmare Bay (9); Bantry
 Bay (9), townet; Valentia (18), townet.

General distribution.—N. Atlantic, Mediterranean, Indian Ocean.GENUS **Bradya**, Boeck, 1872.**Bradya typica**, Boeck*Bradya typica*, Boeck, 1872.

Gola Islands, Donegal (9), townet.

General distribution.—British Seas.GENUS **Tachidius**, Lilljeborg, 1853.**Tachidius brevicornis** (Müller).*Cyclops brevicornis*, Müller, 1785.*Tachidius brevicornis*, Lilljeborg, 1853.

Dundrum (16), brackish pools.

General distribution.—North Europe.

GENUS **Euterpe**, Claus, 1863.

Euterpe acutifrons (Dana).

Harpacticus acutifrons, Dana.

Euterpe gracilis, Claus, 1863.

— — —, Brady, 1880.

Euterpe acutifrons, Giesbrecht, 1891.

Kinsale Harbour (4), townet.

General distribution.—N. Atlantic, British Seas, Canary Islands, Mediterranean.

GENUS **Stenhelia**, Boeck, 1864.

Stenhelia hispida, Brady.

Stenhelia hispida, Brady, 1878.

Clew Bay (4), 10 fms. ; Ventry Bay (4).

This species is often obtained amongst the fronds of *Laminaria*, and is sometimes brought up in dredged material.

General distribution.—British Seas.

Stenhelia ima (Brady).

Canthocamptus imus, Brady, 1872.

? *Canthocamptus rostratus*, Claus, 1863.

Stenhelia ima, Brady, 1878.

Clew Bay (4), taken in the dredge.

General distribution.—British seas.

GENUS **Ameira**, Boeck, 1864.

Ameira longipes, Boeck.

Ameira longipes, Boeck, 1864.

Roundstone Bay (4), amongst roots of algæ.

This species is often obtained in dredged material.

General distribution.—British seas, N. Atlantic.

? **Ameira amphibia**, Brady.

Ameira amphibia, Brady, 1902.

Newcastle, Co. Down (5), "on mussel beds between tide marks on the beach," occurred plentifully.

If Giesbrecht's definitions of the genera of the *Stenbelinae* be correct, then the above species does not appear to belong to either *Ameira* or *Nitokra*. Brady, in his description of the

species (16), says that it is very likely that a new genus may have to be instituted for the reception of the species.

General distribution.—N. of Ireland.

GENUS **Jonesiella**, Brady, 1878.

Jonesiella spinulosa (B. & R.).

Zosime spinulosa, Brady and Robertson, 1875.

Jonesiella spinulosa, Brady, 1878.

Westport Bay (4), in townet.

It is most probable that this species usually haunts the bottom. It has been found in dredged material up to a depth of 37 fathoms.

General distribution.—British seas, &c.

GENUS **Mesochra**, Boeck.

Mesochra Lilljeborgi, Boeck.

Mesochra Lilljeborgi, Boeck, 1864.

Paratachidius gracilis, B. and R., 1873.

Westport (4), brackish tidal pools; Clifden (4) (7), pond just above high water mark; Dundrum (5), brackish pool.

General distribution.—British Isles, N. Europe.

GENUS **Diosaccus**, Boeck, 1872.

Diosaccus tenuicornis (Claus).

Dactylopus tenuicornis, Claus, 1863.

Nitokra tenuicornis, B. and R., 1873.

Diosaccus tenuicornis, Brady, 1878.

Westport Bay (4), townet; Roundstone Bay (4), townet; Clifden Bay (4), amongst *Laminaria*; Larne (13), surface townet.

General distribution.—British seas, N. Atlantic.

GENUS **Laophonte**, Philippi, 1840.

Laophonte hispida (B. & R.).

Asellopsis hispida, Brady and Robertson, 1873.

Laophonte hispida, Brady, 1878.

Westport Bay (4), surface net; Valentia (18), (19), townet.

General distribution.—British seas, &c.

Laophonte subsalsa, Brady.*Laophonte subsalsa*, Brady, 1902.

Dundrum, Co. Down (5), brackish pools a little above high water; Donegal (5), in the Glen Estuary.

General distribution.—British Isles, &c.

Laophonte curticauda, Boeck.*Laophonte curticauda*, Boeck, 1864.

Clifden (4), on weeds; Roundstone (4), amongst weeds; Westport Bay (4), amongst weeds; Killeany, Galway Bay (9), townet; Valentia (18), townet; Larne L. (13), townet, and washings from Laminaria.

This is a littoral species occurring in tidal pools and amongst the weeds in shallow water.

General distribution.—British seas, &c.

Laophonte serrata (Claus).*Cleta serrata*, Claus, 1863.*Laophonte serrata*, Brady, 1878.

Clew Bay (4), dredged in shallow water; Roundstone Bay (4), amongst the roots of weeds; Mulroy Lough (4), amongst the roots of weeds; Ventry Bay (4), dredged in shallow water.

A littoral species.

General distribution.—N. Atlantic, Indian Ocean.

Laophonte horrida (Norman).*Cleta minuticornis*, Buchholz, 1869.*Cleta horrida*, Norman, 1876.*Laophonte horrida*, Brady, 1878.

Mulroy Lough, Donegal (4), amongst the fronds of Laminaria.

A bottom form found in littoral waters.

General distribution.—British seas, Arctic sea, &c.

Laophonte similis (Claus).*Cleta similis*, Claus, 1866.*? Cleta forcipata*, Norman, 1868.*Laophonte similis*, Brady, 1878.

Clifden Bay (4); Roundstone Bay (4); Westport Bay (4); Ventry Bay (4); Killeany, Galway Bay (9).

This species occurs from high-water mark to a depth of several fathoms. It is plentiful on weeds at low water.

General distribution.—British seas, &c.

Laophonte longicaudata, Boeck.

Laophonte longicaudata, Boeck, 1864.

Laophonte Hodgii, Brady, 1872.

Ventry Bay (4), roots of weeds; Kenmare Bay (9).
General distribution.—N. Atlantic.

Laophonte lamellifera (Claus).

Cleta lamellifera, Claus, 1863.

Laophonte lamellifera, Brady, 1878.

Lough Swilly (4), 2 fms.; Ventry Bay (4), in dredge.
 This species, like most members of this genus, is a bottom form found in littoral waters.
General distribution.—N. Atlantic.

GENUS **Normanella** Brady, 1878.

Normanella dubia (B. & R.).

Laophonte dubia, Brady and Robertson, 1875.

Normanella dubia, Brady, 1878.

Clew Bay (4).

A bottom form found up to a depth of about 30 fms.
General distribution.—British seas, &c.

GENUS **Cletodes**, Brady, 1872.

Cletodes limicola, Brady.

Cletodes limicola, Brady, 1872.

Cletodes pectinata, B. and R., 1875.

Westport Bay (4), obtained in the dredge; Kenmare Bay (9), townet.

A bottom form found up to a depth of 45 fathoms.
General distribution.—British seas, &c.

Cletodes propinqua, B. & R.

Cletodes propinqua, Brady and Robertson, 1875.

Clew Bay (4).

A bottom form found up to a depth of about 35 fathoms.
General distribution.—N. Atlantic, &c.

Cletodes linearis (Claus).*Lilljeborgia linearis*, Claus, 1866.*Orthopsyllus linearis*, B. and R., 1873.*Cletodes linearis*, Brady, 1878.

Westport Bay (4), (7), found on a sponge; Roundstone Bay (4), amongst roots of algae; Kenmare Bay (9), townnet.

A littoral species. Sometimes taken in the open sea.

General distribution.—British seas, N. Atlantic, Indian Ocean.

GENUS **Enhydrosoma**, Boeck, 1872.**Enhydrosoma curvatum** (B. & R.).*Rhizothrix curvata*, Brady and Robertson, 1875.*Enhydrosoma curvatum*, Brady, 1878.

Lough Swilly (4), 3 fathoms. Sandy bottom.

A littoral species, found up to a depth of about 35 fathoms.

General distribution.—British seas, &c.

GENUS **Dactylopus**, Claus, 1863.**Dactylopus flavus**, Claus.*Dactylopus flavus*, Claus, 1866.

Clew Bay (4).

Bottom form found up to a depth of 35 fathoms.

General distribution.—N. Atlantic, &c.

Dactylopus minutus, Claus.*Dactylopus minutus*, Claus, 1863.

Westport Bay (4), townnet.

General distribution.—N. Atlantic.

Dactylopus Stromii (Baird).*Cyclops Stromii*, Baird, 1837.*Nauplius Stromii*, Philippi, 1843.*Canthocamptus Stromii*, Baird, 1850.*Dactylopus cinctus*, Claus, 1866.*Dactylopus Stromii*, Brady, 1878.

Ventry Bay (4); Valentia (4); Killybegs (4); Clew Bay (4), dredged; Cleggan (8), townnet; Roundstone Bay (5); Ballygally Bay, Co. Antrim (6), dredged; Larne (13), townnet.

General distribution.—N. Atlantic.

Dactylopus tisboides, Claus.*Dactylopus tisboides* Claus, 1866.? *Dactylopus Normanii*, Brady, 1872.

Clifden (4), brackish pools; Westport Bay (4), surface townet; Dundrum Bay, Co. Down (5), brackish pools; Roundstone Bay (5); Ballygally Bay, Co. Antrim (6), 4 fathoms; Larne (13), bottom townet and washings from *Laminaria*.

This is a common estuarine form.

General distribution.—British seas, N. Atlantic.

Dactylopus brevicornis, Claus.*Dactylopus brevicornis*, Claus, 1866.

Larne Lough (13), bottom townet.

A bottom form obtained in dredged material up to a depth of 40 fathoms.

General distribution.—N. Atlantic.

GENUS **Thalestris**, Claus, 1863.**Thalestris longimana**, Claus.*Thalestris longimana*, Claus, 1863.

Valentia (4), (18), surface townet; Killybegs (4), townet; Kenmare Bay (9), townet; Bantry Bay (9); Cleggan (8), townet; Newcastle, Co. Down (5); Ballygally Bay, Co. Antrim (6), 4 fathoms; Larne (13), bottom townet, and amongst *Laminaria* roots.

A very common and well-marked British form. Occurs principally in the littoral zone, but it is sometimes found in the open sea.

General distribution.—N. Atlantic, &c.

Thalestris Clausi, Norman.*Thalestris Clausi*, Norman, 1868.*Parathalestris Clausi*, B. & R., 1873.*Thalestris Clausi*, Brady, 1878.

Clifden Bay (4); Westport Bay (4); Valentia (18); Cleggan (8); Newcastle, Co. Down (5); Roundstone Bay (5); Dundrum Bay (5); Larne Lough (13).

A common British species. Occurs in the littoral zone and in the open sea.

General distribution.—British seas, &c.

Thalestris peltata (Boeck).*Anemophia peltata*, Boeck, 1864.*Thalestris peltata*, Brady, 1878.

Valentia (18).

Not a very common form.

General distribution.—British seas, N. Atlantic.**Thalestris rufocincta**, Norman.*Thalestris rufocincta*, Norman, 1878.

Clew Bay (4); Lough Swilly (4); Clifden Bay (4); Mulroy Lough (4), on fronds of algae; Bertraghboy Bay (4), on fronds of algae; Ventry Bay (4), on fronds of algae; Cleggan (8), townet; off Whitehead, Belfast Lough (6), 7-10 fathoms; Larne Lough (13), roots of *Laminaria*.

A common littoral species.

General distribution.—British seas, &c.**Thalestris helgolandica**, Claus.*Thalestris helgolandica*, Claus, 1863.

Clifden Bay (7); Cleggan (8), townet.

General distribution.—British seas, North Sea.**Thalestris harpactoides**, Claus.*Thalestris harpactoides*, Claus, 1863.

Killybegs (4), surface townet; Cleggan (8), townet.

General distribution.—British seas, North Sea.**Thalestris mysis**, Claus.*Thalestris mysis*, Claus, 1863.

Westport Bay (4), dredge and townet; Clifden Bay (4); Roundstone Bay (4); off Whitehead, Belfast Lough (6), 10 fathoms; Ballygally Bay, Co. Antrim (6), 4 fathoms; Larne Lough (6), (13), roots of *Laminaria*.

A littoral species.

General distribution.—British seas, N. Atlantic, Mediterranean, Indian Ocean.**Thalestris hibernica**, B. and R.*Thalestris hibernica*, Brady and Robertson, 1873.

Westport Bay (4), (7), townet.

General distribution.—British seas.

Thalestris Krohnii, Kröyer.*Thalestris Krohnii*, Kröyer, 1845.*Thalestris serrulata*, Brady, 1878.*Thalestris Krohnii*, Sars, 1886.

Larne Lough (13) surface townet.

Not a very common British species.

General distribution.—N. Atlantic.GENUS **Westwoodia**, Dana, 1855.**Westwoodia nobilis** (Baird).*Arpacticus nobilis*, Baird, 1850.*Westwoodia nobilis*, Claus, 1863.

Ventry Bay (4), (7), 14 fathoms; Mulroy Lough (4), (7), 14 fathoms; Roundstone Bay (4), between tide marks; Larne Lough (13), surface townet.

A littoral species.

General distribution.—N. Atlantic.GENUS **Ilyopsyllus**, B. and R., 1873.**Ilyopsyllus coriaceus**, B. & R.*Ilyopsyllus coriaceus*, Brady and Robertson, 1873.

Roundstone Bay (4), (7), "In black mud and in the roots of weeds."

General distribution.—British seas, &c.GENUS **Harpacticus**, Milne-Edwards, 1838.**Harpacticus gracilis**, Claus.*Harpacticus gracilis*, Claus, 1863.

Galway Bay (4); Mayo (4); Mouth of the Shannon (4); Cleggan (8), townet; Dundrum Bay (5); Roundstone Bay (5)

General distribution.—Littoral waters of N. Atlantic.**Harpacticus chelifer** (Müller).*Cyclops chelifer*, O. F. Müller, 1776.*Nauplius chelifer*, Philippi, 1843.*Arpacticus chelifer*, Baird, 1850.*Harpacticus chelifer*, Claus, 1863.

This common species has been recorded by most workers at Irish Copepoda. It is a littoral species, and is sometimes found in enormous numbers amongst the weeds.

General distribution.—Atlantic, Indian Ocean.

Harpacticus fulvus, Fischer.

Harpacticus chelifer, Lilljeborg, 1853.

Harpacticus fulvus, Fischer, 1860.

Harpacticus curticornis, Boeck, 1864.

Tigriopus Lilljeborgi, Norman, 1868.

Harpacticus crassicornis, B. & R., 1875.

Harpacticus fulvus, Brady, 1878.

Kinny Lough, Donegal (fresh water) (4); coasts of Galway (4); Great Isle of Aran (4); Mouth of the Shannon (9); Valentia (18).

General distribution.—British Isles, Baltic and North Sea coasts, Kerguelen Islands.

Harpacticus flexus, B. and R.

Harpacticus flexus, Brady and Robertson, 1873.

Harpacticus flexus, Brady, 1878.

Westport Bay (4), townet; Lough Swilly (4), dredged; Newcastle Co. Down (5).

General distribution.—British Isles, &c.

GENUS **Alteutha**, Baird, 1845.

Alteutha interrupta (Goodsir).

Sterope interrupta, Goodsir, 1845.

Alteutha boprides, Claus, 1863.

Alteutha norvegica, Boeck, 1864.

Peltidium interruptum, Brady, 1878.

Valentia (18), townet; Ballinskellig (12), bottom; off Whitehead, Belfast Lough (6), 7-10 fathoms; Larne Lough (13), townet and roots of laminaria; Cleggan (8), townet.

General distribution.—N. Atlantic, &c.

Alteutha depressa, Baird*Alteutha depressa*, Baird, 1845.*Carillus oblongus*, Goodsir, 1845.*Peltidium purpureum*, White, 1857.*Alteutha purpurocincta*, Norman, 1868.*Peltidium depressum*, Brady, 1878.? *Alteutha purpurea*, I. C. Thompson, 1892.

Clifden Bay (4); Mouth of the Shannon (9), townet; Whitehead, Belfast Lough (6), 7-10 fathoms; Larne Lough (13) roots of *Laminaria*; Valentia (18), townet.

General distribution.—British seas, North Sea, &c.

Alteutha crenulata (Brady).*Peltidium crenulatum*, Brady, 1878.

Roundstone Bay (4).

General distribution.—British seas, &c.

GENUS **Porcellidium**, Claus, 1860.**Porcellidium viride** (Philippi).*Thyone viridis*, Philippi, 1840.*Porcellidium dentatum*, Claus, 1860.*Porcellidium viride*, Brady, 1878.

Clifden Bay (4); Bertraghboy Bay (4); Valentia (18), (19).

General distribution.—Littoral waters of N. Atlantic.

Porcellidium fimbriatum, Claus.*Porcellidium fimbriatum*, Claus, 1863.

Clifden Bay (4); Bertraghboy Bay (4); Newcastle, Co. Down (5); Larne Lough (13), roots of *Laminaria*.

General distribution.—Littoral waters of the N. Atlantic, Indian Ocean.

Porcellidium subrotundum, Norman.*Porcellidium subrotundum*, Norman, 1868.

Clifden Bay (4); Bertraghboy Bay (4); Killeany Bay (9).

General distribution.—Littoral waters of N. Atlantic.

Porcellidium tenuicauda, Claus.

General distribution.—Littoral waters of N. Atlantic.

Clifden Bay (4); Bertraghboy Bay (4); Ventry Bay (4).
Amongst the roots of *Laminaria*.

General distribution.—Littoral waters of N. Atlantic.

GENUS *Idya*, Philippi, 1843.

Idya furcata (M.-E.).

Cyclopsina furcatus, M.-E., 1834.

Cyclops furcatus, Baird, 1837.

Nauplius furcatus, Philippi, 1843.

Canthocamptus furcatus, Baird, 1850.

Tisbe furcata, Lilljeborg, 1853.

Tisbe ensifera, Fischer, 1860.

Idya furcata, Boeck, 1864.

Killybegs (9); Valentia (18), townet; Newcastle (5); Dundrum, Co. Down (5); Cleggan (8), townet; Larne (13), townet and roots of *Laminaria*.

This is a very common littoral species.

General distribution.—North Atlantic, Mediterranean, Indian Ocean.

GENUS *Scutellidium*, Claus, 1866.

Scutellidium fasciatum (Boeck).

Porcellidium fasciatum, Boeck, 1864.

Aspidiscus fasciatus, Norman, 1868.

Scutellidium fasciatum, Brady, 1878.

Ventry Bay (4); Clifden Bay (4); Newcastle, Co. Down (5); Larne (13), *Zostera* beds and roots of *Laminaria*.

General distribution.—Littoral waters of the N. Atlantic.

Scutellidium tisboides, Claus.

Scutellidium tisboides, Claus, 1866.

Clifden Bay (4); Roundstone Bay (4); Newcastle, Co. Down (5); Larne Lough (13), roots of *Laminaria*.

General distribution.—Littoral waters of N. Atlantic.

GENUS *Zaus*, Goodsir, 1845.

Zaus spinatus, Goodsir.

Zaus spinatus, Goodsir, 1845.

Ventry Bay (4), amongst sea weeds; Newcastle (5).

A littoral species.

General distribution.—British Isles, &c.

FAMILY CYCLOPIDAE.

GENUS *Cyclopina*, Claus, 1863.*Cyclopina gracilis*, Claus.*Cyclopina gracilis*, Claus, 1863.Lough Swilly (4), *Zostera* beds.*General distribution*.—North Atlantic, &c.*Cyclopina littoralis*, Brady.*Cyclopina littoralis*, Brady, 1872.

Lough Swilly (4), 2 fathoms, (9), tow-net; Mulroy Lough (4), 16 fathoms; Killybegs (9), tow-net; Mouth of the Shannon (9), tow-net; Bantry Bay (9), tow-net; Valentia (18), tow-net; Larne (13), tow-net.

General distribution.—North Atlantic, &c.GENUS *Thorellia*, Boeck, 1864.*Thorellia brunnea*, Boeck.*Thorellia brunnea*, Boeck, 1864.*Cyclops nigricauda*, Norman, 1868.*Cyclops pallidus* (young), Norman, 1868.

Westport Bay (4) (7), tow-net; Clifden Bay (4) (7), fronds of *Laminaria*; Mulroy Lough (4) (7), weeds; Ventry Bay (7), tow-net; Kinsale Harbour (4).

This species is generally found amongst the weeds in littoral waters, but it also occurs in the open sea.

General distribution.—North Atlantic, Indian Ocean.GENUS *Cyclops*, Müller, 1776.*Cyclops aequoreus*, Fischer.*Cyclops aequoreus*, Fischer, 1860.

Clifden (4) (7), "in a pool near high-water mark"; Belfast (4); Dundrum, Co. Down (5), brackish pools.

This fresh water species is included for the reasons given in the Introduction.

General distribution.—Europe (generally fresh water).

FAMILY ASCIDICOLIDAE.

GENUS **Notodelphys**, Allman, 1847.**Notodelphys cerulea**, Thorell.*Notodelphys cerulea*, Thorell, 1859.? *Notodelphys tenera*, Thorell, 1859.

Roundstone Bay (4). Between tide-marks.

This species is generally found parasitic in the branchial sac of *Ascidia parallelogramma* and *Ascidia venosa*.*General distribution*.—North Atlantic, &c.**Notodelphys Allmani**, Thorell.? *Notodelphys ascidicola*, Allman, 1847.*Notodelphys Allmani*, Thorell, 1859.? *Notodelphys elegans*, Thorell, 1859.? *Notodelphys rufescens*, Thorell, 1859.Belfast Bay (4); Strangford Lough (4); Dublin Bay (4); Killary Bay, Co. Galway (4); Bangor, Co. Down (4); Glendore Harbour, Co. Cork (4); all these were found in the branchial sac of *Ascidia communis*. Belfast Lough (16), Larne Lough (13), both from branchial sac of *Ascidia mentula*, Off Whitehead (6), 7-10 fathoms.*General distribution*.—North Atlantic, &c.GENUS **Doropygus**, Thorell, 1859.**Doropygus Normani**, Brady.*Doropygus Normani*, Brady, 1878.Roundstone Bay (4), branchial sac of simple Ascidians; Larne Lough (13), from *Ascidia mentula*.*General distribution*.—North Atlantic, Ceylon, &c.**Doropygus porcicauda**, Brady.*Doropygus porcicauda*, Brady, 1878.Bertraghboy Bay (4), branchial sacs of *Ascidia parallelogramma*, &c.*General distribution*.—British seas, &c.

Doropygus pulex, Thorell*Doropygus pulex*, Thorell, 1859.

Canon Norman found specimens of a variety of this species in simple Ascidians from Roundstone Bay (4).

General distribution.—North America, Ceylon, &c.

GENUS **Notopterophorus**, Costa, 1852.**Notopterophorus papilio**, Hesse.*Notopterophorus papilio*, Hesse, 1864.

Ballygally Bay (13). Branchial sac of *Ascidia* sp.

This species was obtained from several simple Ascidians in Ballygally Bay in such numbers as to mark it as a common species. Therefore it is surprising that such an apparently common form has not been recorded from Ireland before. This is probably due to the fact that comparatively little work has been done with regard to these Ascidian parasites in Ireland.

General distribution.—North Atlantic, &c.

GENUS **Botachus**, Thorell, 1859.**Botachus cylindratus**, Thorell.*Botachus cylindratus*, Thorell, 1859.

Larne Lough (13), from the branchial sac of *Ascidia* sp.

Like the preceding species, this species has not been recorded before from Ireland. It is probably a rare species.

General distribution.—North Atlantic.

GENUS **Enterocola**, Van Beneden, 1861.**?Enterocola hibernica**, T. and A. Scott, 1895.*Enterocola hibernica*, T. and A. Scott, 1895.

Valentia (15), taken from an Ascidian.

With regard to this and the following species Messrs. T. and A. Scott were uncertain about the genus.

General distribution.—S. Ireland.

?Enterocola Beaumonti, T. and A. Scott.*Enterocola Beaumonti*, T. and A. Scott, 1895.

Valentia (15), taken from an Ascidian.

General distribution.—S. Ireland.

FAMILY ASTEROCHERIDAE.

GENUS **Dermatomyzon**, Claus, 1889.**Dermatomyzon nigripes** (B. and R.).*Cyclopicera nigripes*, Brady and Robertson, 1875.? *Ascomyzon Thorelli*, Sars, 1880.*Dermatomyzon elegans*, Claus, 1889.*Dermatomyzon nigripes*, Giesbrecht, 1897.

Lough Swilly (4), 7 fathoms; off Whitehead (6), 7-10 fathoms.

General distribution.—British Isles, Spitzbergen, Mediterranean.GENUS **Asterocheres**, Boeck, 1859.**Asterocheres Lilljeborgi**, Boeck.*Asterocheres Lilljeborgi*, Boeck, 1859.*Artrotrogus Lilljeborgi*, Brady, 1898.

Westport Bay (4), "on a sponge."

General distribution.—British seas, Mediterranean.**Asterocheres Boeckii** (Brady).*Artrotrogus Boeckii*, Brady, 1878.*Asterocheres Boeckii*, Giesbrecht, 1899.

Westport Bay (4), townet; Roundstone Bay (4) townet; off S.W. Ireland (2) townet, 75 fathoms; off Whitehead, Belfast Lough (6), 7-10 fathoms; Larne Lough (6), 2 fathoms.

This species is generally found at the bottom, and has been taken in fairly deep water. It has been described by Thorell as being a common parasite in the branchial chamber of *Ascidia parallelogramma*.*General distribution*.—British seas, Mediterranean.**Asterocheres echinicola** (Norman).*Ascomyzon echinicola*, Norman, 1868.*Cyclopicera lata*, Brady, 1872.*Cyclopicera echinicola*, Giesbrecht, 1895.*Asterocheres echinicola*, Giesbrecht, 1897.

Lough Swilly (4), 8 fathoms, sandy bottom.

A bottom form generally found in the littoral zone.

General distribution.—British Isles, Mediterranean.

GENUS **Acontiophorus**, Brady, 1878.

Acontiophorus scutatus (B. and R.).

Solenostoma scutatum, B. & R., 1873.

Acontiophorus scutatus, Brady, 1880.

Roundstone Bay (4), surface net; Westport Bay (4), townet; Clifden Bay (4), roots of *Laminaria*; Whitehead, Belfast Lough (6), 7-10 fathoms; Larne Lough (13), roots of *Laminaria*.

General distribution.—British Isles, Mediterranean, Madeira, New Zealand.

GENUS **Bradypontius**, Giesbrecht, 1895.

Bradypontius magniceps (Brady).

Artrotrogus magniceps, Brady, 1878.

Artrotrogus orbicularis, B. & R. (not Boeck), 1875.

Artrotrogus Normani, Canu, 1891 (not Brady).

Bradypontius magniceps, Giesbr., 1895.

Larne Lough (6) (13), 2-4 fathoms.

General distribution.—British Isles, Mediterranean.

FAMILY LICHOMOLGIDAE.

GENUS **Lichomolgus**, Thorell, 1859.

Lichomolgus furcillatus, Thorell.

Lichomolgus furcillatus, Thorell, 1859.

Roundstone Bay (4), townet; Westport Bay (4), townet; Lough Swilly (4), 7-8 fathoms; Mulroy Lough (4), 10 fathoms.

This is a littoral species, and is often found in the branchial sacs of simple Ascidians.

General distribution.—North Atlantic, &c.

Lichomolgus fucicolus (Brady).

Macrocheiron fucicolum, Brady, 1872.

Lichomolgus fucicolus, B. & R., 1873,

Clifden Bay (4); Roundstone Bay (4); Westport Bay (4), amongst weeds; Lough Swilly (4), 8 fathoms, sandy bottom; Newcastle, Co. Down (5), 5 fathoms, sandy bottom; Roundstone Bay (5), townet.

This is a littoral species, and so far as I can ascertain it is never found in simple Ascidians.

General distribution.—British seas, &c.

Lichomolgus forficula, Thorell.

Lichomolgus forficula, Thorell, 1859.

Mulroy Lough (4), 10 fathoms; Larne Lough (13), branchial sac of *Ascidia* sp.; Ballygally Bay, Co. Antrim (13) branchial sac of simple Ascidians.

This form is sometimes found free in the *Laminaria* zone. It is often found in simple Ascidians.

General distribution.—North Atlantic, &c.

GENUS **Pseudanthessius**, Claus, 1889.

Pseudanthessius liber (B. and R.).

Lichomolgus liber, Brady and Robertson, 1875.

Pseudanthessius liber, T. Scott, 1894.

Lough Swilly (4), 7-8 fathoms, sandy bottom.

This species frequents the bottom up to a depth of about 30 fathoms. It is never found in the branchial sacs of Ascidium.

General distribution.—North Atlantic, Indian Ocean.

Incerte sedis.

GENUS **Lomanoticola**, T. and A. Scott, 1895.

Lomanoticola insolens, T. and A. Scott.

Lomanoticola insolens, T. and A. Scott, 1895

Valentia 15. Parasitic on a nudibranch, *Lomanotus Genei*, at a depth of 8 fathoms.

General distribution.—S. Ireland.

ii.—FISH PARASITES.

FAMILY CALIGIDAE.

GENUS *Caligus*, Müller, 1785.*Caligus centrodoni*, Baird.*Caligus centrodoni*, Baird, 1850.Dublin (1), on *Pagellus centrodonus*.*Distribution*.—British seas.*Caligus curtus*, Müller*Caligus curtus*, Müller, 1785.*Caligus Mülleri*, Leach, 1816.*C. bicuspidatus*, Nordm., 1832.*C. elegans* ?, Van Beneden, 1851.*C. americanus*, Dana, 1838.*C. diaphanus*, Baird, 1840.

N. of Ireland (16), various fishes; Belfast Lough (1); Lough Neagh (fresh water) (1), on the pollan.

Hosts.—Gadidae, *Trigla* sp., *Rhombus maximus*, *Mugil* sp.*Caligus minimus*, Otto.*C. minimus*, Otto, 1828.*C. minutus*, M.-E., 1840.

Belfast (16).

Host.—Gills of *Labrax lupus*.*General distribution*.—European seas.*Caligus rapax*, M.-E.*Caligus rapax*, M.-E., 1840.*C. elongatus*, Nordm., 1832.*C. leptochilus*, Leuckart.Bantry Bay (9), townnet; Valentia (18) (19), townnet; Belfast Lough (1); ? Lough Neagh (16), on trout and pollan; Cleggan (8), townnet; Larne Lough (13), townnet; also parasitic on *Cyclopterus lumpus* and *Pleuronectes platessa*.

This species is very often obtained in the townnet.

Hosts.—Gadidae, *Trigla* sp., Pleuronectidae, *Zeus faber*, Salmonidae, *Cyclopterus lumpus*, &c.

Caligus diaphanus, Nordmann.

C. diaphanus, Nordm., 1832.

„ Basset-Smith, 1896.

Belfast (16).

Hosts.—Gills of *Trigla* spp., Pleuronectidae.

General distribution.—British seas.

[? **Caligus scomberi**, J. V. Thompson.]

S. of Ireland (16).

The identity of this species is very uncertain, as Thompson (16) gives no description. Basset-Smith's species, *C. scomberi*, is dated 1896, and is probably quite a distinct species.

GENUS **Lepeophtheirus**, Nordm., 1832.

Lepeophtheirus Thompsoni, Baird.

Lepeophtheirus Thompsoni, Baird, 1850.

L. gracilis, Van Beneden, 1851.

N. of Ireland (1).

Host.—Gills of *Rhombus maximus*.

Distribution.—British seas.

Lepeophtheirus obscurus, Baird.

Lepeophtheirus obscurus, Baird, 1850.

(*Caligus*) *obscurus*, Basset-Smith, 1896.

Belfast Bay (1), on brill.

Host.—*Rhombus laevis*.

Distribution.—British seas.

Lepeophtheirus pectoralis (Müller).

Lernaea pectoralis, Müller, 1776.

Lepeophtheirus pectoralis, Nordm., 1832.

Caligus pectoralis, Kr., 1838.

Belfast (16), on Pleuronectidae, mackerel, conger.

Hosts.—Pleuronectidae, mackerel, conger, *Callionymus lyra*.

General distribution.—European seas.

Lepeophtheirus Nordmanni, M.-E.*Lepeophtheirus Nordmanni*, M.-E., 1840.*Caligus Nordmanni*, Thompson, 1847.

Antrim coast (16), on sunfish.

Host.—*Orthogoriscus mola*.**Lepeophtheirus sturionis**, Kröyer.*Lepeophtheirus sturionis*, Kröyer, 1837.*Caligus sturionis*, Thompson, 1856.Belfast (16), on *Trigla hirundo**Hosts.*—*Trigla* spp. *Acipenser sturio*.**Lepeophtheirus Stromii** (Baird).*Caligus Stromii*, Baird, 1836 (?).*Lepeophtheirus Stromii*, Baird, 1847.*Laxe lusi*, Kjöbenh.? *Caligus vesper*, M.-E., 1840.*C. salmonis*, Stp. and Lütke, 1861.

Dundrum Bay (16); Cushendall, Co. Antrim (16), on salmon; Donaghadee (1).

Hosts.—Salmonidae.GENUS **Demoleus**, Heller.**Demoleus paradoxus** (Otto).*Caligus paradoxus*, Otto, 1828.? *C. productus*, Müller, 1785.? *Nogagus grandis*, Heller, 1865.*Demoleus paradoxus*, Basset-Smith, 1899.

N. of Ireland (16); Belfast Bay (16).

Host.—Dog-fish.*General distribution.*—Mediterranean, British seas.GENUS **Trebius**, Kröyer, 1838.**Trebius caudatus**, Kröyer.*Trebius caudatus*, Kr., 1838.? *Tr. spinifrons*, M.-E., 1840.Belfast Lough (16), attached to *Raia batia*.*Hosts.*—*Raia* spp., *Galeus vulgaris*, &c.

GENUS **Cecrops**, Leach, 1816.

Cecrops Latreillei, Leach.

Cecrops Latreillei, Leach. 1816.

S. of Ireland (16); Dublin (16) (1); Antrim Coast (16); Kinsale (1).

Host.—*Orthogoriscus mola*.

Distribution.—British seas, Mediterranean.

FAMILY DICHELESTIIDAE.

GENUS **Dichelestium**, Herm., 1804.

Dichelestium sturionis, Herm.

Dichelestium sturionis, Herm., 1804.

Dichelestium sturionis, Thompson, 1856.

S. of Ireland (16).

Host.—Gills of *Acipenser sturio*.

FAMILY LERNAEIDAE.

GENUS **Lernaeenicus**, Les.

Lernaeenicus encrasicoli (Turton).

Lernaea encrasicola, Turton, 1807.

Lernaeonema encrasicoli, Baird, 1850.

Lernaeenicus encrasicoli, Olsson, 1869.

Youghal (1), on the sprat.

Hosts.—*Engraulis encrasicolus* and *Clupea spratta*.

Lernaeenicus sprattae (Sowerby).

Lernaea spratta, Sowerby, 1806.

Lernaea cyclophora, Blainv., 1822.

Lernaeocera survivensis, Blainv., 1823.

Lernaea ocularis, Cuvier, 1830.

Foroculum spratti, Thompson.

Lernaeonema monillaris, M.-E., 1840.

Lernaeonema spratta, Baird, 1850.

Lernaeonema bairdi, Salter, 1850.

Youghal (16).

Host.—*Clupea spratta*.

General distribution.—Europe.

GENUS **Lernaea**, Linn., 1767.

Lernaea branchialis, Linn.

Lernaea branchialis, Linn., 1767.

Lernaea gadina, Müller.

Lernaeocera branchialis, Blainv., 1823.

Lernaeocera sigmordea, Stp. & Lützk., 1861.

Belfast Bay (16) (1), on gills of cod; Dublin (1).

Hosts.—Gills of Gadidae.

General distribution.—North temperate region.

FAMILY CHONDRACANTHIDAE.

GENUS **Chondracanthus**, De la Roche, 1811.

Chondracanthus lophii, Johnstone.

Chondracanthus lophii, Johnstone, 1836.

Ch. gibbosus, Thompson, 1856.

Lernentoma lophii, Baird, 1850.

Belfast Bay (16) on angler fish; Dublin (16) on angler.

Host.—Gills of *Lophius piscatorius*.

Chondracanthus cornutus, (Müller).

Lernaea cornuta, Müller, 1776.

Anops cornuta, Oken, 1815.

Entomoda cornuta, Lamarek, 1818.

Lernentoma cornuta, Blainv., 1823.

Chondracanthus cornutus, Cuvier, 1830.

Dublin (16) (1), gills of the sole.

Hosts.—Gills of Pleuroneetidae.

FAMILY LERNAEOPODIDAE.

GENUS *Lernaeopoda*, Kröyer.*Lernaeopoda galei*, Kröyer.*Lern. galei*, Kr., 1837.*Lern. musteli*, Thompson, 1889.

Belfast (16) (1); off Valentia (11) on ventral fin of *Galeus vulgaris*.

Hosts.—Fins of *Mustelus vulgaris*, *M. antarcticus*, *Squalus acanthus*, *Scyllium canicula*.

Lernaeopoda salmonea, Linn.*Lernaeopoda salmonea*, Linn, 1761.*Pediculus salmonis*, Gisler, 1751.*Lernaeopoda cyprinacea*, Hermann, 1783.*Entomoda salmonea*, Lamarek, 1818.*Lernaeopoda salmonea*, Blainv., 1823.*Lernaeopoda carpionis*, Kr., 1837.*Basanistes salmonea*, M.-E., 1840.

N. of Ireland (16).

Hosts.—Salmonidae.

Lernaeopoda bidiscalis, Kane.*Lernaeopoda bidiscalis*, Kane, 1890.

Off Valentia (11), "on Claspers of *Galeus vulgaris*."

GENUS *Anchorella*, Cuvier.*Anchorella uncinata* (Müller).*Lernaea uncinata*, Müller, 1776.*Schisburus uncinatus*, Oken, 1815.*Clavella uncinata*, Oken, 1815.*Lernaeomyzon uncinata*, Blville., 1823.*Anchorella uncinata*, Nordm., 1832.

Larne (16); Holywood (16); Dublin (16).

Hosts.—Gills and mouth of the Gadidae.

General distribution.—British seas, North Sea.

Anchorella emarginata, Kröyer.*Anchorella emarginata*, Kr., 1837.— *rugosa*, Kr., 1837.Larne (1), mouth of *Gadus* sp.*Hosts*.—Gills of *Alosa finta*, *Anarrhichas lupus*, *Gadus* sp.*General distribution*.—Europe.REFERENCES TO PUBLICATIONS RECORDING IRISH
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THE MARINE FAUNA OF THE COAST OF
IRELAND.PART VI.¹

PYCNOGONIDA.

BY

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PLATES I. TO III.

The collections of marine invertebrates made during the last few years under the auspices of the Fisheries Branch of the Department contain many specimens of Pycnogonida or "Sea-spiders." Most of the pycnogons enumerated in the present paper were dredged in the harbours of Ballynakill and Bofin. A few were obtained by dredging in the Irish Sea and St. George's Channel, and some from the deeper waters of the North Atlantic slope. The specimens now recorded from the shores, harbours, and shallow waters of our eastern and western coasts add to our previous knowledge of the distribution of these curious animals in the Irish area (see *Carpenter*, 1893). But, as might have been anticipated, it is among the specimens from the deeper Atlantic waters that we find the most interesting results. A single haul in the townet on trawl, at a depth of 382 fathoms, 77 miles W.N.W. of Achill Head, brought up three species of Pycnogonida unknown in British waters:—a northern Nymphon—*N. leptocheles*, Sars; the hitherto undiscovered male (exhibiting remarkable structural features) of a blind northern Anoplodactylus—*A. typhlops*, Sars; and a new species of Pallenopsis, a genus not before recorded from the British and Irish area, most of its species being southern in their distribution. Also, from a station 50 miles W.N.W. of the Tearaght, the townet on dredge captured, at a depth of 306 fathoms, an adult egg-bearing male of a handsome undescribed species of Anoplodactylus. It is noteworthy that this method of collecting delicate bottom-organisms by towact has succeeded admirably with the Pycnogons as with the Schizopods and the Cumacea.

¹ This series has hitherto been entitled "The Marine Fauna of the West Coast of Ireland." Since its inception, facilities for work on the East Coast have been materially increased, and henceforth it will be convenient to deal with the fauna under the general group without geographical subdivision.

Fisheries, Ireland, Sci. Invest., 1904, IV., [Published, November, 1905].

FAMILY NYMPHONIDAE.

Nymphon gracile, Leach.

♂ *Nymphon gracile*, Leach.¹ *Zool. Misc.*, vol. i., 1814, p. 45.

♀ *N. femoratum*, Leach. *Ib. l.c.*, pl. xix., fig. 2.

N. gallicum, Hoek. *Arch. Zool. Exp. et Gen.*, vol. ix., 1881, pp. 501-3, pl. xxiii., figs. 6-9.

Nec *N. gracile*, Hoek and Sars.

LOCALITIES—

Ballynakill Harbour: Off Coastguard Bay, 3-4 fms., 1 male with eggs, 8th April, 1903; 1 male, 3 females, 3 young, 2nd April, 1903.

Coastguard Deep, 6-8 fms., 1 immature, 29th September, 1902.

Bofin: 1 young specimen, 7th August, 1899.

This well-known species is evidently widely distributed around our coasts, and it occurs on the French shore of the Channel. As it is not mentioned by Sars in his great work (1891), it may be presumed to belong to the southern faunistic group.

Nymphon rubrum, Hodge.

Nymphon rubrum, Hodge. *Nat. Hist. Trans., Northumberland and Durham*, 1862-4, p. 41, pl. x., fig. 1.

N. rubrum, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, p. 58, pl. v., fig. 2.

LOCALITIES—

Off Rockabill, Irish Sea, in mosquito net, 1 female, 30th January, 1902.

This form, known only from British and Norwegian waters, has occurred at several localities on the east coast of Ireland, but has not as yet been noticed on the west.

Nymphon leptocheles, G. O. Sars.

Nymphon leptocheles, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, pp. 7880, pl. viii., fig. 1.

LOCALITY—

77 miles W.N.W. of Achill Head, 382 fms. In tounet on trawl, 24th August, 1901, 1 female and 1 young specimen.

The discovery of this handsome *Nymphon* in deep water off the coast of Connaught is of great faunistic interest, as it is a distinctly northern species, hitherto unknown in British or Irish

¹ This synonymy, the result of a careful examination of Leach's types in the British Museum, has been kindly communicated to me (*in litt.*) by the Rev. Canon A.M. Norman, F.R.S.

waters. According to Sars it occurs along the west coast of Norway, at depths of from 50 to 100 fathoms, and between Finmark and Bären Island, at 191 fathoms. *Norman* (1894) also records it from the Norwegian coast, and states that the "Porcupine" dredged it in 59° 34' N. lat. in 542 fms. *Meinert* (1899) records the species as taken by the "Ingolf" expedition off Iceland and in the Davis' Strait, at depths varying from 362 to 600 fathoms.

***Chaetonymphon hirtum* (Fabr.).**

Nymphon hirtum, Fabr. Entom. Syst. iv., p. 417.

Nymphon spinosum, Goodsir. *Edinb. New Phil. Journ.*, vol. xxxii., p. 139, pl. iii., fig. 3.

Chaetonymphon hirtum, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, pp. 101-3, pl. xi., fig. 1.

LOCALITIES—

Irish Sea : Off Kish Bank, 25-27 fms., 12th February, 1902, immature.

Lambay Deep, 12th February, 1902, immature.

This is another northern species already recorded from the east but not so far from the west coast of Ireland. According to *Norman* (1894) it has an extensive range around the British shores of the North Sea. I am in agreement with *Norman* in regarding Goodsir's *spinosum* as probably referable to *C. hirtum*, and not to *C. spinosum* of Sars, which *Meinert* (1899) and *Möbius* (1901) identify with the widespread arctic pycnogon *C. hirtipes* (Bell).

FAMILY PALLENIDÆ.

***Pallene brevirostris*, Johnston.**

Pallene brevirostris, Johnston. *Mag. of Zool. and Bot.*, vol. i. p. 380, pl. xii., pp. 7-8.

P. brevirostris, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, pp. 32-6, pl. iii., fig. 1.

LOCALITIES—

Ballynakill Harbour : Coastguard Deep, 6-8 fathoms, 1 female, 17th June, 1902; 1 immature male, 29th September, 1902; 1 male, 23rd October, 1902.

Off Dublin Bay : 1 mile outside Burford Bank, 14 fms., in mosquito net on trawl, 2 females, 18th May, 1903.

This is a common, widespread, and well-known species on the shores of the North Atlantic and adjoining seas.

Pallenopsis Holti, sp. nov.

Plate I., figs. 1-6.

LOCALITY—

77 miles W.N.W. of Achill Head, 382 fms., in tounet on trawl, 24th August, 1901.—One female.

Length (including proboscis and abdomen), 5 mm. Length of leg, 15 mm.

Female. Body rather stout, smooth; chelifori distinctly four-segmented,¹ the two basal segments equal to one another (figs. 1, 2, 3). Proboscis sub-cylindrical, somewhat swollen centrally, longer than bead. False leg (female) shorter than proboscis, the fourth segment longer and stouter than the second or fifth: the five terminal segments distinctly smaller than the others, the seventh and eighth sub-equal, shorter than the sixth, but longer than the ninth and tenth, which are also sub-equal in length, though the ninth is markedly swollen distally (figs. 2, 4). Walking legs elongate, rather sparsely covered with hairs and bristles; second coxal segment three times as long as the first or third; lengths of femur and tibial segments as 4: 3.5: 4.5; tarsus with several strong spines; propodus with three large and five smaller spines beneath; auxiliary claws slender and only one-third length of principal claw (fig. 6). Eye eminence bluntly conical (fig. 2), with the eyes undergoing degeneration, the lenses being indistinct and the pigmentation poor. Abdomen slender and fusiform.

The form of the oculiferous tubercle and of the proboscis separate this from any described species of *Pallenopsis* known to me. Most of the animals belonging to this genus are from the southern hemisphere, but *Wilson* (1881) described two species from the American part of the North Atlantic, and *Meinert* (1899), has lately described a remarkable species—*P. plumipes* from the eastern North Atlantic, 61° 32' N. lat., 13° 40' W. long., at a depth of 950 fms.

Anoplodactylus oculatus, sp. nov.

Plate II., figs. 7-11.

LOCALITY—

50 miles W.N.W. of Tearaght, 306 fms., tounet on dredge, 7th August, 1903.—1 male with eggs.

Length (including proboscis), 4.5 mm. Length of leg, 11 mm.

Male. Body slender, rather rugose, each lateral process with a few feeble spines. Eye-eminence very pointed and prominent, directed forwards; proboscis more than half as long as body, markedly swollen in the middle; abdomen vertical and conical (figs. 7, 8). Cheliforus with basal segment (scape) elongate, clavate and bearing strong spines, hand powerful, two-thirds length of

¹ The "hand" and "movable finger" of a pycnogon's cheliforus are clearly modified segments of the appendage, and should be described as such.

scape (fig. 8). False leg springing from base of foremost lateral process; third segment the longest, twice as long as the second, and swollen near the base; fourth segment slightly longer than the fifth, which bears numerous bristles, and near its base a strong hooked spine; sixth segment short and rounded, with several bristles, and a small blunt claw at its tip (figs. 8, 9). Walking legs slender and rather hairy, second coxal segment with a conical, terminal process, more than thrice the length of the first or third; femur, with a conical terminal process and five conspicuous cup-shaped openings for ducts of cement glands (figs. 7, 10), longer than either of the tibial segments, which are equal to each other; propodus rather stout, with very minute auxiliary claws; arrangement of spines as usual in this genus (fig. 11).

This species is allied to our well-known *A. petiolatus* (Kröyer), but its large size and the excessively elongate and pointed eye-eminentia distinguish it at a glance.

Anoplodactylus typhlops, G. O. Sars.

Plate III., figs. 12-19.

Anoplodactylus typhlops, G. O. Sars. Pycnogonidea of Norwegian N. Atlantic Expedition, pp. 29-31, pl. ii, fig. 3

LOCALITY—

77 miles W.N.W. of Achill Head, 382 fms., in tow-net or trawl, 24th August, 1901—One male with eggs.

This remarkable specimen agrees in size and structure so closely with Sars' *A. typhlops* that I have no hesitation in considering it to be the hitherto unknown male of that species. The only features in which a difference can be noted is that the colour of this specimen is green (Sars' female type is stated to be white), and that there is a slight prominence marking the position of the eye-eminentia, and even indications of the remains of lenses (figs. 17-18). (In Sars' type the eyes are said to have vanished completely).

The false legs (present in the male only in this genus) are as long as the body; the third segment is by far the longest (nearly twice as long as the second) and swollen near the base; on this segment the eggs are carried in a pear-shaped mass; the fourth segment is slightly longer than the fifth and sixth together; the appendage carries only simple slender bristles (figs. 12-13).

A most remarkable structural feature of this pycnogon is the insertion of the false legs midway along the lateral processes that carry the foremost walking legs (figs. 12, 13, 15). In most species of the genus (e.g., *A. petiolatus*, Kr.), the false leg arises between the base of the proboscis and the base of the lateral process; in others, as *A. oculatus* just described, and *A. gestiens* (Ortmann 1890), the false leg springs from the base of the lateral process; in the present species it has apparently migrated along the process.

Hitherto *A. typhlops* has been found only off the Norwegian coast south of the Trondjhem Fiord at a depth of 100 fms.

Anoplodactylus petiolatus (Krøyer).

Phoxichilidium petiolatum, Krøyer. *Nat. Tidsskr.* (2). Vol. i., p. 123.

Anoplodactylus petiolatus, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, pp. 25-29, pl. ii, fig. 2.

LOCALITIES—

Ballynakill Harbour: Barnadery Bay, $\frac{1}{2}$ fm., 1 male, 29th July, 1901.

Off Coastguard Bay, 3-4 fms., 2 males with eggs, 8th April, 1903; 1 male and 1 female, 12th July, 1902; 1 female, 2nd April, 1903.

Coastguard Deep, 6-8 fms., numerous males and females, 29th September, 1902; 5 females, 23rd October, 1902.

Bofin: 1 larva, 7th August, 1900.

4 miles S.S.E. of Beetle Head, $14\frac{1}{2}$ fms., 1 young specimen, 1st August 1901.

1 mile S.S.W. of Carlingford Bar, 12-15 fms., in tow-net on trawl, 1 male with eggs and 2 females, 28th October, 1902.

This exceedingly common species is well-known around our coasts, and ranges from Norway to the Mediterranean.

Anoplodactylus pygmaeus (Hodge).

Pallene pygmaea, Hodge. *Ann. Mag. Nat. Hist.* (3), vol. v. p. 116, pl. xiii, figs. 16, 17.

LOCALITIES—

Ballynakill Harbour: Fahy Bay, 1 fm., 1 female, 27th October, 1901.

Coastguard Deep, 6-8 fms., 1 male and 1 young, 17th June, 1902.

This form is also widespread on our coasts. It is doubtfully distinct from the preceding, but I have not followed Sars and others in uniting the two, as adults can be readily distinguished which show the shortened form of trunk and neck characterizing the animal as described by Hodge.

FAMILY AMMOTHEIDAE

Ammothaea echinata (Hodge).

Achelia echinata, Hodge. *Ann. and Mag. Nat. Hist.*, vol. xiii., 1864, p. 115, pl. xii, figs. 7-10.

Ammothaea echinata, G. O. Sars. *Pycnogonidea of Norwegian N. Atlantic Expedition*, pp. 120-4, pl. xiii, fig. 1.

LOCALITIES—

Ballynakill Harbour: Off Coastguard Bay, 3-4 fms., 1 female, 16th December, 1901; 2 males and 2 females, 2nd April, 1903; 3 males with eggs, and 2 females, 8th April, 1903.

Coastguard Deep, 6-8 fms., 2 females, 23rd October, 1902.

North Entrance, 7-8 fms., 1 male with eggs, 24th June, 1901.

This is a widespread and common pycnogon, ranging from the southern coasts of Norway to the Mediterranean.

FAMILY PHOXICHILIDAE.

Phoxichilus laevis, Grube.

Phoxichilus laevis, Grube. *Abhandl. der Schles. Gesellsch. f. vaterl. Cultur*, 1869-72, p. 75.

P. spinosus, Sars. Pycnogonidea of Norwegian N. Atlantic Expedition, pp. 15-20, pl. i., fig. 3.

LOCALITIES—

Ballynakill Harbour: Off Coastguard Bay, 3-4 fms. many immature, 12th July, 1902.

Coastguard Deep, 6-8 fms., 1 young, 17th June, 1902.

Bofin: Young specimens, 26th and 27th June, 1900; 2 females, 1st July, 1900; 1 male, 1 female, and 1 young, 25th September, 1900; 1 male, 18th August, 1900.

Off Dungarvan: 1 female, 18th March, 1904.

I have previously (1893) given reasons for separating this form, which is common all around our coast, from the larger and scarcer form which I regard as the true *P. spinosus*, Montagu.

FAMILY PYCNOGONIDAE.

Pycnogonum littorale (Stroem).

Phalangium littorale, Stroem. *Physisk og oekonomisk Beskrivelse* (1762), p. 209, pl. i., fig. 17.

Pycnogonum littorale, Sars. Pycnogonidea of Norwegian N. Atlantic Expedition, pp. 7-12, pl. i., fig. 1.

LOCALITIES—

50 miles W.N.W. of Cleggan Head, 120 fms.: 4 males (2 with eggs) and 2 females, 13th July, 1903; in tow-net on trawl, 4 females, 17th August, 1903; 1 female and 1 young, 12th September, 1901.

50 miles N.W. by N. of Cleggan Head: 1 male with eggs, 1 female, and 1 immature female, 13th Sept., 1901.

27 miles W. by N. of Bray Head, Valentia Island, 100 fms.: 1 male with eggs, and 1 female, 24th March, 1904.

7 miles W. of Skelligs, off Co. Kerry: 1 female, 5th February, 1904.

This, perhaps the best known of all members of the order, has an immense geographical and bathymetric range in the North Atlantic.

All the specimens enumerated in this paper have been deposited in the Dublin Museum of Science and Art.

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PLATE I.

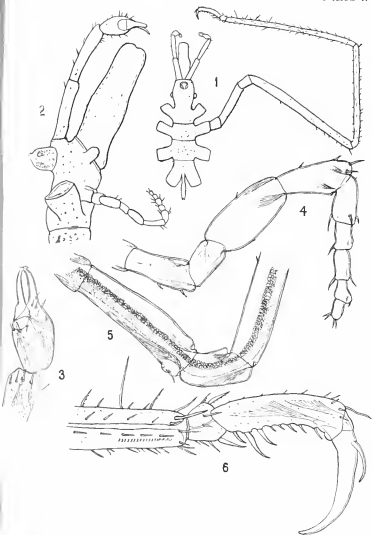
- Pallenopsis Holti.**—Fig. 1. Dorsal view $\times 10$.
 Fig. 2. Side view of head and proboscis $\times 20$.
 Fig. 3. Hand of cheliforus $\times 55$.
 Fig. 4. False leg $\times 80$.
 Fig. 5. Coxal segments and base of femur of first leg. $\times 27$.
 Fig. 6. Walking leg: end of second tibial segments, with tarsus and propodus $\times 55$.

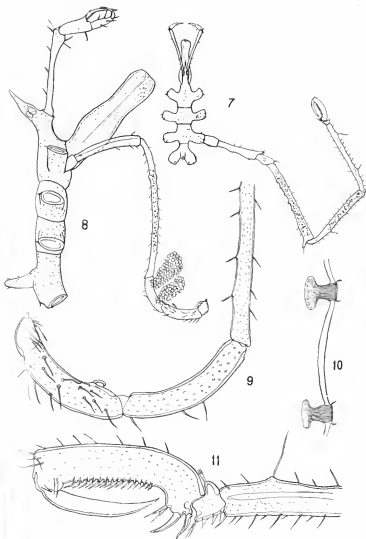
PLATE II.

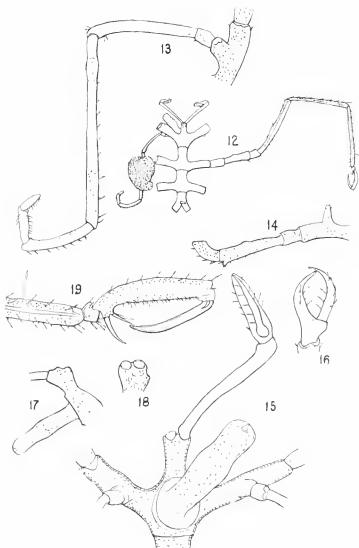
- Anoplodactylus oculatus.**—Fig. 7. Dorsal view $\times 10$.
 Fig. 8. Side view $\times 20$.
 Fig. 9. False leg (end of third and three terminal segments) $\times 80$.
 Fig. 10. Cement glands and ducts on femur of walking leg $\times 160$.
 Fig. 11. Walking leg: end of second tibial segment, with tarsus and propodus $\times 55$.

PLATE III.

- Anoplodactylus typhlops.**—Fig. 12. Dorsal view $\times 10$.
 Fig. 13. False leg, springing from foremost lateral process $\times 40$.
 Fig. 14. Side view of hind trunk-segment abdomen, and coxal segments of walking leg $\times 20$.
 Fig. 15. Ventral view of head, cheliforus, and proboscis $\times 40$.
 Fig. 16. Hand of cheliforus $\times 40$.
 Fig. 17. Side view of head and proboscis $\times 20$.
 Fig. 18. Oblique view of forehead, showing vestigial eye-emincence $\times 20$.
 Fig. 19. Walking leg: end of second tibial segment, with tarsus and propodus $\times 55$.



*Anoplodactylus oculatus.*



G. H. . del.

Anoplodactylus typhlops.

APPENDIX, No. V.

SCHIZOPODOUS CRUSTACEA FROM THE NORTH-
EAST ATLANTIC SLOPE.

SUPPLEMENT.

BY

E. W. L. HOLT AND W. M. TATTERSALL, B.Sc.

PLATES I. TO V.

The present note contains diagnoses and figures of several species which were provisionally described in Appendix, No. IV., of the Report for 1902-3,* and we have included additional records in order to complete the list, in essentials, for the period ending in September, 1905. The localities are denoted by magnetic bearings, except in a few instances, where latitude and longitude are mentioned.

Certain forms, though we have but little to add to previous records of capture, require mention on account of the discoveries of our friend, Dr. H. J. Hansen, of Copenhagen, to whom we desire to express our thanks for the most generous help. In his recent papers, which are referred to later under their several titles, it is shown that the Euphausian which, following Sars, we have previously recorded as *Euphausia pellucida* is only one of several species hitherto grouped under that name, and is more properly known as *E. Mülleri*, Claus (= *T. bidentata*, Sars). It follows that the account which we gave of the geographical distribution requires revision to make it applicable to the restricted species. The same applies to the forms known since the publication of Sars' *Challenger* monograph as *Eucopia australis*, and one is tempted to conjecture that as the opportunities of exact knowledge of oceanic animals increase, so will the list of truly cosmopolitan species be found to decrease.

Dr. Lo Bianco's papers on the results of the cruises of the *Puritan* and *Maia*, which we had previously overlooked, afford us an opportunity of materially adding to the

* *Ann. Rep. Fisheries, Ireland, 1902-3, Pt. II.* [1905]. Species, &c., instituted by us in that paper are here denoted by the initials H. and T.

Fisheries, Ireland, Sci. Invest., 1904, V., [Published, June, 1906].

horizontal range assigned in our previous communication to several species, and since the author has kindly permitted us to examine his material we have in some instances been able to suggest a different interpretation of the systematic definition.

To Canon Norman we are indebted for the loan of co-types without which it would have been impossible to decide the species of a *Pseudomma* previously recorded as *P. roseum*, but in reality *P. affine*; and, as usual, we have not hesitated to afflict our friend Dr. Calman with many demands on his valuable time.

The records additional to those already given enrich the census of the British-and-Irish area by five species :

Thysanopoda distinguenda, Hansen.
Eucopia sculpticauda, Faxon.
Euchaetomera Fowleri, H. and T.
Pseudomma nanum, sp. n.
Boreomysis microps, G. O. Sars.

Pseudomma roseum is expunged from the list, and replaced by *P. affine*, G. O. Sars; *Mysideis Farrani* becomes *Mysidetes Farrani*. Correction of nomenclature causes *Euphausia pellucida*, *Stylocheiron longicorne*, *S. chelifer* and *Eucopia australis* to be replaced by *E. Mülleri*, *S. Suhmi*, *S. abbreviatum* and *E. unguiculata*. We have traced our record of *Meterythrops robusta* to a clerical error, specimens which were correctly determined and labelled as *Parerythrops obesa* having been entered in the note-book as *P. robusta*. *M. robusta* therefore disappears from the list, and we are obliged to Dr. Hansen for suggesting the error.

Siriella norvegica, already known from the coasts of England and Scotland, is now noted from the west of Ireland.

Three oceanic species, *Stylocheiron clongatum*, *Bentheuphausia amblyops* and *Petalophthalmus armiger* have been taken immediately to the west of the British-and-Irish area, and may, from experience with other forms, be expected to occur sooner or later within the 1,000-fathom line.

The principal addition to the *Helga's* collecting equipment consists of a large townet in the form of a pelagic otter-trawl, designed and presented to us by Dr. C. G. Johan Petersen. The net is made of strong coarse cheese-cloth or butter muslin, the seams strengthened by bolt-ropes which take much of the strain off the material. The opening is about eight feet by four feet.

It is, like all the townets now used by the *Helga*, an open net and therefore fishes not only at the depth to which it is sunk, but also (and probably more efficiently) from thence to the surface. So far we are unacquainted with any self-closing horizontal net sufficiently large to capture active

pelagic animals of considerable size. The net must be big, since, if the animals are to be taken in good condition, the meshes must be small, and no fine material can be hauled at a high rate of speed. The limit to which the size of any even occasionally-efficient pattern of horizontal self-closing net can be raised is very soon determined by the weight of frame and messengers. Vertical self-closing nets appear to present less difficulty, but in the comparatively shallow water in which the *Helga* usually works the zones of observation are necessarily narrow, and could not be properly explored without an infinite repetition of hauls about each station. Probably no sort of haul can by arithmetical processes be made to yield a safe estimate of the larger denizens of the surrounding water or section of the sea floor, since such processes must presume that which is not, viz., an approximate equality in the distribution of organisms over a given area; and however difficult it may be to relegate to their proper vertical positions the contents of a long horizontal haul made with a large open net, they may be suspected to comprise at least a fair qualitative sample of the more active members of the fauna.

Hansen's records deal mainly with the captures made in 1904 by the *Princess Alice* with certain large townets, which do not differ, in their probable fishing capacity, from the Petersen trawl or the big triangular net used by the *Helga*. The range of the *Princess Alice* extends in effect to the seas between the Canary Islands, the Azores, and the Bay of Biscay, the latter being explored to no great extent. The bay, therefore, forms a neutral territory separating the operations of the *Princess Alice* from those of the *Helga* (and *Oceana*) off the south-west and west coasts of this country, and it seems of interest to contrast the evidence of pelagic Schizopodous fauna afforded by use of similar gear in the two areas. The *Princess Alice* naturally had, apart from considerations of latitude, the better chance of collecting oceanic forms, forms, since the *Helga* is restricted to a comparatively narrow margin of activity, and the *Oceana* made only a few hauls. The respective results, in species, are given below. Seventeen species are common, and among those which appear to be restricted to one or the other area, some at least may be supposed, from previous record, to belong essentially to boreal or tropical communities.*

*In relation to this table we have not the means of comparing data other than those of locality and season. Our own records for 1905 appear to have been affected not only by the use of new nets but also by an unusual distribution of the Atlantic waters.

[TABLE.

PRINCESS ALICE.	HELGA (and OCEANA).
<i>Euphausia</i> Mülleri, brevis, gibba, gibboides.	<i>Euphausia</i> Mülleri, Lanei.
<i>Thysanopoda</i> vulgaris, scutifrons, distinguenda, lateralis, insignis, egregia, aequalis, pectinata.	<i>Thysanopoda</i> acutifrons, distinguenda.
<i>Meganyctiphanes</i> norvegica.	<i>Meganyctiphanes</i> norvegica.
<i>Thysanoessa</i> gregaria, parva.	<i>Nyctiphanes</i> Couchi.
<i>Nematocelis</i> megalops, microps, tenella.	<i>Boreophausia</i> inermis.
<i>Nematobrachion</i> bolipis.	<i>Thysanoessa</i> gregaria (? includes parva), longicaudata, neglecta.
<i>Stylocheiron</i> Suhmi, elongatum, abbreviatum.	<i>Nematocelis</i> megalops.
<i>Bentheuphausia</i> amblyops.	<i>Nematobrachion</i> bolipis.
<i>Eucopia</i> unguiculata, intermedia, sculpticauda.	<i>Stylocheiron</i> Suhmi, elongatum, abbreviatum.
<i>Gnathophausia</i> zoea.	<i>Bentheuphausia</i> amblyops.
<i>Boreomysis</i> microps, semicoeca.	<i>Eucopia</i> unguiculata, sculpticauda.
<i>Katerithrops</i> Oceanac.	<i>Gnathophausia</i> zoea, drepanophora.
<i>Euchaetomera</i> Fowleri.	<i>Petalophthalmus</i> armiger.
	<i>Boreomysis</i> microps.
	<i>Katerithrops</i> Oceanac.
	<i>Euchaetomera</i> Fowleri.
	<i>Meterythropis</i> picta.
	<i>Chunomysis</i> diadema.

Terminology.—The thoracic appendages are referred to as thoracic limbs. The "maxillipede" thus becomes the first thoracic limb, and its endopod the first leg, and so on.

DIVISION EUCARIDA, Calman.

ORDER EUPHAUSIACEA.

FAMILY EUPHAUSIIDAE.

SUB-FAMILY EUPHAUSINAE, H. and T.

GENUS *Euphausia*, Dana.

Euphausia Mülleri, Claus, 1863.

Thysanopoda bidentata, G. O. Sars, 1882.

Euphausia pellucida (pars), G. O. Sars, 1885.

Euphausia pellucida, H. and T., 1905 (1).

Euphausia bidentata, H. and T., 1905, (2).

Euphausia Mülleri, Hansen, 1905 (3).

In our first communication (1905 (1)) we followed Sars in giving the name *E. pellucida*, Dana, to North-Atlantic Euphausiidae with two pairs of lateral denticles on the carapace. While preparing a note of the *Oceana* schizopods (1905 (2)) examination of some Euphausiidae placed in Mr. Tattersall's hands by Professor Herdman suggested that *E. pellucida*, Sars, might be a too comprehensive species, and this was confirmed by an intimation that Dr. Hansen was kind enough to

give us of the work which he had then in hand. We accordingly used Sars' name *E. bidentata* in the *Oceana* note, having then no acquaintance with Claus' earlier diagnosis of *E. Mülleri*. Stebbing (1900) lists *E. bidentata* and *E. Mülleri* as separate species.

Hansen has since revised the Euphausiac of this group, and has shown that the designation *E. Mülleri* is proper to those of the genus which have a multifid leaflet on the first antennular joint, and this is the case in all our material, from the *Research*, the *Oceana*, and the *Helga*.

The specimen of 26 mm. to which we have previously referred is undoubtedly *E. Mülleri* as re-defined by Hansen. It was taken off the Bay of Biscay in July, 1900, and some other examples taken at the same time are not much smaller. Hansen notes that in the collections to which he has had access many Mediterranean specimens are larger than those from the Atlantic, with the exception of a single individual. He gives 19.5 mm. as the size of the largest which he has observed.

We suspect that the life-history and ultimate growth-limit of Euphausians may be dependent on oceanic conditions which are not necessarily of seasonal recurrence, and that the data as yet available do not warrant the establishment of a local size-limit.

The restriction in specific interpretation entails a revision of our previous account of the distribution. *E. Mülleri* is only known, with certainty, from the Atlantic, its extreme northern range touching the coast of Norway, while to the south it does not appear to reach the latitude of Cape Colony. It extends, as we have seen, into the Mediterranean.

Additional Records.

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., August, 1904, tow-net at surface.—Seven.

50 mi. W.N.W. of Tearaght, Co. Kerry, 350 fath., November, 1904, large tow-net at 350 fath.—Five, 10 to 14 mm.

40 mi., same course and date, 244 fath., tow-net on dredge.—One, 9 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., November, 1904, tow-net at 600 fath.—Eight, 15 mm., and two, 9 mm.

48 mi. W.N.W. of Tearaght, Co. Kerry, 337 fath., November, 1904, tow-net on trawl.—One, 15 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, tow-net on trawl.—One, 8 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, tow-net at 700 fath.—One, 9 mm.; six, 12 to 17 mm.

20 mi. N.W. of Achill Head, 102 fath., November, 1904, tow-net at surface.—One, 10 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 670 fath., February, 1905, townet at 630 fath.—Twenty-eight, 8 to 16 mm.; townet at 500 fath.—Three, 12 to 15 mm.

45 mi. N. of Eagle Island, Co. Mayo, 1,000+ fath., February, 1905, townet at surface.—Forty, 10 to 18 mm.

West of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $14^{\circ} 50' W.$, 500 fath., May, 1905, townet on trawl.—Three, 17 mm.

West of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, coarse townet at surface.—Nine, 15 to 18 mm.

Same station, Petersen trawl at 700 fath.—Thirteen, 15 to 18 mm.

Porcupine Bank, Lat. $53^{\circ} 20' N.$, Long. $13^{\circ} 0' W.$, 164 fath., May, 1905, townet on trawl.—One, 14 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Four, 15 to 18 mm.

GENUS *Thysanopoda*, M.-Ed.

Thysanopoda acutifrons, H. & T.

Pl. I.

Thysanopoda acutifrons (*pars*), Holt and Tattersall, 1905 (1).

Thysanopoda pectinata, Hansen, 1905 (1), *nec* Ortmann, 1893, *nec* Hansen, 1905 (2).

Thysanopoda acutifrons, Hansen, 1905 (2).

It is by accident rather than by adequacy of description that we remain the sponsors of this species, which was excellently described by Hansen under the name of *T. pectinata*, Ortmann. The Danish author has since found (1905 (2)) that there actually existed, in the collections placed at his disposal, a form exactly fulfilling Ortmann's description of *T. pectinata*, and has therefore retained our name for the specimens which he had previously assigned to Ortmann's species. Since, when he was kind enough to examine our types of *T. acutifrons*, he found them to consist of a medley of mature specimens of one and immature specimens of another species, he would, we imagine, have been quite justified in consigning *H. acutifrons* to oblivion, and attaching a new name to his already adequate diagnosis. For reasons of which his reputation offers sufficient explanation, he did not adopt this course, and we are free to choose a proper series of types and append to them a sufficient diagnosis.

Diagnosis.

Form stoutly built, slightly compressed laterally. *Carapace* without lateral denticles (see p. 11), the front part of a broadly triangular plate, the angle at the apex greater than a right angle and terminating in a short sharp tooth which is directed

obliquely forward and upward; sides of the triangular plate slightly inflated, apex not extending beyond the visual part of the eye but generally falling short of it: carapace exhibits in the median dorsal line a low keel. *Pleon segments* with pleural plates of moderate size and the usual form, none of the segments exhibiting any trace of spines on their posterior borders; last segment almost as long as the two preceding ones combined. *Preanal spine* well developed and simple. *Eyes* small with rather short stalks, the greatest width of the cornea scarcely exceeding the width of the antennular peduncle, pigment brown. *Antennular peduncle* strongly built, the basal joint bearing a strong slightly curved sharp spine on its outer distal corner, the anterior end of the basal joint bearing a densely hispid forwardly directed lappet roughly triangular in shape, terminating anteriorly in a short acute process, the whole lappet extending for about one-third of the way along the second joint of the peduncle, its inner edge furnished with strong plumose bristles which interlock with those of the other peduncle; second joint of the peduncle longer than the third, its anterior border produced into a broadly rounded lobe without spine. *Antennal scale* extending about half way towards the extremity of the third joint of the antennular peduncle, broadly oval in shape and rather wide, its total length very little more than twice its greatest breadth, apex broadly rounded, outer margin entire without trace of terminal spine, basal spine about one-third of the length of the scale, slender and quite smooth. *First maxilla* with the masticatory lobes well developed, the terminal joint of the palp narrow and short, not projecting beyond the masticatory lobes, exognath well developed and extending beyond the terminal joint of the palp. *Second maxilla* almost exactly as in *T. obtusifrons*, G. O. Sars. *First thoracic legs* with the terminal joint bearing a row of about twelve short plumose setae on its inner edge. *Second thoracic legs* with the terminal joint bearing ten strong plumose setae on its inner edge in addition to the terminal setae and eight short curved spines, which increase in size distally, on its inner face. *Last thoracic limb* without endopod, the inner produced corner of the exopod bearing six long plumose setae. *Telson* rather slender, tapering towards the apex and some little way from the latter suddenly constricted and drawn out into a very acute point which shows no trace of secondary spines; subapical spines projecting beyond the tip of the telson and quite smooth; dorsal surface of the telson armed with four pairs of denticles set on faint ridges which run down the length of the telson, the posterior pair arising at the same level as the subapical spines, the most anterior pair arising about half way down the telson. *Uropods* with the outer plate a little longer than the inner, which just overreaches the tip of the telson. *Length* of the largest specimen, 33 mm.

The diagnosis may be assisted by a dichotomic table, in which the characters of *T. acutifrons* and *T. distinguenda* are compared. The true *T. pectinata* may be disregarded, because it has a really obtuse rostrum, while *T. lateralis*, Hansen, will,

if ever found in our seas, be easily distinguished by the slender dorsal spine of the third segment of the pleon, and the broad border of the carapace (see Hansen, 1905 (1)) quite distinct from the narrow border common to *T. distinguenda* and *T. acutifrons*.

Thysanopoda

having the carapace destitute (except in larvae) of lateral denticles and produced to form a conspicuous pointed rostrum, neither abruptly elevated nor depressed. Segments of the pleon without conspicuous dorsal prolongations.

	<i>T. acutifrons.</i>	<i>T. distinguenda.</i>
Length of adults,	About 35 to 44 mm., ..	About 20 to 25 mm
Colouration, ..	Brick-red in life without any conspicuous dark pigment.	Red in life. Dark pigment in variable amount—at its maximum extending more or less continuously over all parts, except the legs and pleopods.
Eye, ..	Rather small, light brown in adult, much darker in young.	Small, brownish black.
Antennule, ..	Lappet of proximal joint as seen from the side not acutely spiniform at anterior extremity.	Lappet of proximal joint acutely spiniform.
Antennal scale,	Extends at least to the middle of the third joint of the antennular peduncle.	Scarcely extends beyond the second joint of the antennular peduncle.
Pleon, ..	Terga of fourth and fifth segments not acuminate at the posterior median margin.	Terga of fourth and fifth segments very slightly acuminate at the posterior median margin.

We are sensible that the differences expressed in this table are not of a very tangible character, but, although the two forms are at least entitled to rank as very distinct varieties, we do not know how to express their individualities more exactly. Our figures, which, as it happened, were drawn from each species when the other was not available for comparison may from this circumstance be exonerated from any attempt to exaggerate the points of distinction.

The mouth parts, which in the genus *Thysanopoda* as a whole afford the opportunity, to him who may be desirous of distinction in this direction, of generic sub-division, are not as between *T. acutifrons* and *T. distinguenda* capable of even specific diagnosis save in minutiae which may pardonably be held negligible.

A full-grown *T. acutifrons* is easily recognised, because it is like no other known species of its size. A mature male *T. distinguenda* is also easy to name, because, being mature, it is not big enough to be assigned to *T. acutifrons*!

Large but immature males of *T. acutifrons* and mature or nearly mature females of *T. distinguenda* present much greater difficulty, and we must confess that but for the high authority of Hansen we should feel some difficulty in regarding *T. distinguenda* as more than a smaller and perhaps more southern variety of *T. acutifrons*. In specimens of comparable size the difference in the colour of the eyes, though existent, seems to us very slight, and for the distinctive characters of the lappet of the first joint of the antennular peduncle, in so far as they may be more perceptible than our remark above would seem to indicate, readers must be referred to Hansen.

From material recently obtained, we think it probable that the larva of *T. acutifrons* has a lateral denticle on the carapace, though all specimens exceeding 14 mm., and some of less length, have no denticle.

Additional records.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 670 fath., May, 1905, Petersen trawl at 630 fath.—Six, 26-29 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—One, 33 mm.

Hansen mentions that a number of specimens have been received at his museum from the boreal part of the Atlantic. His Monaco specimens are from the region westward of the Bay of Biscay. The use of a pelagic otter-trawl with which Dr. Petersen was kind enough to present us, in 1904, seems to indicate that *T. acutifrons* is probably common enough at or about the 1,000 fathom line off the West of Ireland. It does not appear to be a surface species, but has been taken on one occasion at not more than 75 fath. from the surface. Its absence, save possibly in the larval stage, from Dr. Fowler's *Research* collections made off the northern part of the Bay of Biscay is somewhat remarkable, but more extensive experience than that of which we already dispose may serve to associate it with an oceanic community which the physical conditions of the summer of 1900 did not bring within the region then examined.

Thysanopoda distinguenda, Hansen, 1905 (1) (2).

T. acutifrons (pars), Holt and Tattersall, 1905 (1).

Pl. II.

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., November, 1904, coarse tow-net at 600 fath.—Two, 14 and 19 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, coarse townet at 300 fath.—One, adult male, 19 mm.

This species was described by Hansen from specimens captured near the Azores and Canary Islands. Its occurrence off the west coast of Ireland, therefore, indicates a considerable northern extension of its geographical range. It is thus possible that it may belong typically to the southern part of the North Atlantic, and rarely extends into higher latitudes, while the converse may apply to *T. acutifrons*.

GENUS *Nyctiphanes*, G. O. Sars.

Nyctiphanes Couchi (Bell).

Nyctiphanes norvegica (pars), Lo Bianco, 1903 and 1904.

After the publication of our previous communication Dr. Lo Bianco was kind enough to send us Mediterranean specimens of *N. Couchi* which he had previously regarded as specifically identical with the larger forms correctly referred to *M. norvegica*. The species therefore extends in all probability from North British latitudes to the Mediterranean, though it has not yet been recognised from the coasts of France and the Iberian peninsula.

Among recent *Helga* records we note the occurrence of a few specimens at 50 miles off Eagle Island and 80 miles off Slyne Head.

The distances from land are unusual, and one specimen (taken at 700-0 fath.) is in its present condition remarkable in having the antennular lobes forwardly directed instead of reflexed. It is, we suppose, none the less referable to *N. Couchi*, and since we cannot see how any method of preservation could have affected the flexure of the leaflets it would seem that the latter are not, in nature, invariably reflexed.

Our notes (1905 (1), p. 104) as to the size at which the antennular comb is developed might be held to indicate that ovigerous females of 12 mm. or less are destitute of this adornment. The fact is, however, that all ovigerous females have the comb, though it may not always be developed in females actually larger than the smallest of those which have assumed the cares of maternity, and may be present in specimens of only 8 mm. (see p. 49, *Note added in Press*).

Additional records.

40 mi. S.W. of Fastnet, Co. Kerry, 70 fath., August, 1904, townet at 30 fath.—Five, one ovigerous.

10 mi. W.N.W. of Tearaght, Co. Kerry, 76 fath., November, 1904, townet at surface.—One hundred and eighty-seven, 6 to 15 mm., the smallest in the last larval stage, none ovigerous.

20 mi. N.W. of Achill Head, 102 fath., November, 1904, townet at surface.—Sixty-eight, 9 to 14 mm., none ovigerous

80 mi. W.N.W. of Slyne Head, Co. Galway, 180 fath., August, 1904, townet on trawl.—One, 9 mm., and two fragments.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 700 fath.—One, 11 mm.

10 mi. S.W. of Fastnet, Co. Kerry, 57 fath., February, 1905, townet on trawl.—Five, fragmentary, ca. 10 mm.

30 mi. W.N.W. Tearaght, Co. Kerry, 136 fath., February, 1905, coarse townet at 44 fath.—Five, 10 mm.

GENUS *Meganyctiphanes*, H. & T., 1905 (1).

Meganyctiphanes norvegica (M. Sars).

Nyctiphanes norvegica (pars), Lo Bianco, 1903 and 1904.

Euphausia intermedia, Riggio, 1905, corrected in note at end of paper.

The observations of Lo Bianco and Riggio show that this species, already traced from the Arctic regions to the coast of Portugal, extends to the Italian shores of the Mediterranean. Specimens from the Naples region kindly placed at our disposal by Dr. Lo Bianco do not appear to differ in any important particular from Irish examples. The largest observed by this author measured 33 mm., but, as we are seldom fortunate enough to secure full-grown specimens here, it by no means follows that the species is smaller in the Mediterranean than in the North Atlantic, though such a difference is familiar in the case of some kinds of fish common to the two regions.

The figure which the exigencies of a popular brochure have inflicted upon one of Lo Bianco's memoirs (Lo Bianco, 1904) is not to be taken as an imputation of the accuracy of the determination, nor as conveying the intimation that *M. norvegica* carries the ova in the same manner as *Nyctiphanes australis* and *N. Couchi*. It has, in fact, as we are informed, no connection with *M. norvegica*, and may be presumed to be a sketch of Sars' drawing of the female *N. australis*.

The *Helga* records of *M. norvegica*, subsequent to those already published are of no importance, but Messrs. Farran and Kemp, who have made gastronomic experiment of the species, assure us that however abundant it may become in some subsequent development of economic fishing methods it is never likely to form a welcome addition to the table.

Additional records.

80 mi. W.N.W. of Slyne Head, Co. Galway, 180 fath., August, 1904, townets on trawl.—Ten. Townet at surface.—One, 12 mm.

81 mi. W. of Eagle Island, Co. Mayo, 220 fath., August, 1904, townets on trawl.—Twenty-seven.

54 mi. W. of Eagle Island, Co. Mayo, 200 fath., August, 1904, townet at bottom.—Fifty.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., August, 1904, large townet at 1,000 fath.—Thirteen.

40 mi. same course and date, 750 fath., townet at 750 fath.—Twenty.

48 mi. W.N.W. of Tearaght, Co. Kerry, 337 fath., November, 1904, trawl.—Two, 30 mm.

Same station, townets on trawl.—One, 15 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 350 fath., November, 1904, townet at surface.—Three, 24 to 34 mm.

Same station, large townet at 350 fath.—Eight, 13 to 30 mm.

40 mi., same course and date, 244 fath., townet on dredge.—Seven, 14 to 17 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., November, 1904, townet at 600 fath.—Three, 25 mm.

33 mi. W. of Tearaght, Co. Kerry, 80 fath., November, 1904, trawl (sprat net).—One, 12 mm.

30 mi. W.N.W. of Tearaght, Co. Kerry, 136 fath., February, 1905, townet at 60 fath.—One, 21 mm.

20 mi. N.W. of Achill Head, 102 fath., November, 1904, townet at surface.—One, 16 mm.

50 N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 700 fath.—Three, 21 to 25 mm.

40 mi., same course and date, 670 fath., townet at 630 fath.—One, 28 mm.

45 mi. N. of Eagle Island, Co. Mayo, 1,000+ fath., February, 1905, townet at surface.—Five, 25 mm.

Porcupine Bank, Lat. $53^{\circ} 15' N.$, Long. $13^{\circ} 17' W.$, 116 fath., May, 1905, coarse townet at surface.—One, 27 mm.

SUB.-FAM. NEMATOSCELINAE, H. and T.

GENUS *Thysanoessa*, Brandt.

Thysanoessa neglecta (Kröyer).

Additional records.

30 mi. W.N.W. of Tearaght, Co. Kerry, 136 fath., August, 1904, townet at 44 fath.—Eight, 7 to 9 mm.

Off Rathlin Island, Co. Antrim, 120 fath., February, 1905, dredge.—One, 12 mm.

Thysanoessa longicaudata (Kröyer).*Additional records.*

81 mi. W. of Eagle Island, Co. Mayo, 220 fath., August, 1904, townets on trawl.—Two.

54 mi. W. of Eagle Island, Co. Mayo, 200 fath., August, 1904, townet at bottom.—Two, 10 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., November, 1904, townet at 600 fath.—Fifteen, 8 to 10 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 7 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 600 fath.—Twenty-one, 10 mm.

Same station, townet at 500 fath.—Twenty-nine, 12 mm.

Same station, townet at 700 fath.—One hundred and sixty-three, 8 to 12 mm.

30 mi. N. by W. of Eagle Island, Co. Mayo, 588 fath., May, 1904, townet at 200 fath.—One, 10 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 670 fath., February, 1905, townet at 630 fath.—One hundred, 7 to 12 mm.

45 mi. N. of Eagle Island, Co. Mayo, 1,000+ fath., February, 1905, townet at surface.—Forty-two, 8 to 10 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl at 700 fath.—Sixty-two, 10 to 13 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Four, 10 to 12 mm.

Thysanoessa gregaria, G. O. Sars.*Additional record.*

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 8 mm.

Hansen has recently recorded this species from the Eastern Atlantic near the Azores and Canary Islands. We cannot deny the possibility of representation, in the material referred to here and in our previous communication, of *T. parva*, Hansen (1905 (1) (2)), a species very closely allied to *T. gregaria* but smaller. The most obvious points of distinction are found in the thoracic limbs, but none of the specimens remaining in our hands when Hansen's paper appeared had any legs at all.

GENUS *Nematoscelis*, G. O. Sars.*Nematoscelis megalops*, G. O. Sars.*Additional records.*

40 mi. N. by W. of Eagle Island, Co. Mayo, 750 fath., August, 1904, townet at surface.—Six, 15 mm.

Same station, November, 1904, townet at 600 fath.—Two, 10 and 12 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 16 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 700 fath.—Twelve, 9 to 16 mm.

Same station and date, townet at 500 fath.—One, 15 mm.

40 mi. same course and date, 670 fath., townet at 630 fath.—Seven, 10 to 20 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, Petersen trawl at 700 fath.—Three, 20 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Four, 10 to 24 mm.

Lo Bianco (1903) mentions this species from the Mediterranean, thus extending its known range.

GENUS *Nematobrachion*, Calman.*Nematobrachion boöpis*, (Calman).*Additional records.*

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 500 fath.—One, 20 mm.

Same station, townet at 700 fath.—Three, 8 mm.; two, 19 and 21 mm.

40 mi. same course and date, 670 fath., townet at 630 fath.—Four, 10 to 24 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, Petersen trawl at 700 fath.—Five, 12-28 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Two, 20 mm.

Mention of this species by Hansen from several localities in the eastern part of the Atlantic Ocean between the Bay of Biscay and the Azores considerably extends its known geographical range, which previously appeared to be confined to the water off the north part of the Bay and off the West of Ireland. The most northern record is afforded by specimens taken north-west of the Farøe Bank, $61^{\circ} 11' N.$, $11^{\circ} 00' W.$, 306 fath., June, 1905 (*per* Dr. J. Schmidt).

One of the Irish specimens measures 24 mm. from tip of rostrum to tip of telson.

GENUS *Stylocheiron*, G. O. Sars.*Stylocheiron* *Suhmi*, G. O. Sars.

- S. Suhmii*, G. O. Sars, 1885.
S. longicorne, G. O. Sars, 1885.
S. mastigophorum, Chun, 1888.
S. longicorne, Ortmann, 1893.
S. mastigophorum, Lo Bianco, 1901 and 1903.
S. longicorne, Holt and Tattersall, 1905 (1).
S. Suhmii, Hansen, 1905 (1).
S. Suhmi, Holt and Tattersall, 1905 (2) and (3).

We accept Hansen's demonstration of the identity of *S. Suhmi* and *S. longicorne*, G. O. Sars. The latter name is proper to the adult form, but by accident of place in the *Challenger* memoir *S. Suhmi*, though descriptive of immature stages, has priority.

The change of name does not affect the observations which we have offered on the distribution of the species.

Additional records.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 6 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 600 fath.—One, 6 mm.

Same station and date, townet at 700 fath.—Four, 5 to 8 mm.

40 mi. same course and date, 670 fath., townet at 630 fath.—Five, 7 mm.

45 mi. N. of Eagle Island, Co. Mayo, 1,000+ fath., February, 1905, townet at surface.—Two, 8 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl at 700 fath.—Twenty-three, 8 to 10 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Four, 10 mm.

Stylocheiron elongatum, G. O. Sars.

The *Helga* took a single specimen, 16 mm. in length, 50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., in the Petersen trawl, fished at 1,150 fath., and thence to the surface. Both antennal scales have the tips broken off, but from other characters there seems to be no doubt of the correctness of the specific determination.

This record shows the at least occasional northward range of the species, which was found by the *Challenger* in the South Atlantic, and by the *Princess Alice* (Hansen, 1905 (1)) about the Azores and Canary Islands. It was not taken by the *Research* and *Caudan*, and is not named among the few schizopods of the *Travailleur* and *Talisman* collections as yet publicly determined.

Stylocheiron abbreviatum, G. O. Sars.*S. chelifera*, Chun, 1888.*S. chelifera*, Holt and Tattersall, 1905, (1).*S. abbreviatum*, Hansen, 1905 (1).*S. abbreviatum*, Holt and Tattersall, 1905 (2) and (3).

Hansen has confirmed our opinion that Sars under *S. abbreviatum* described, however imperfectly, the young of Chun's *S. chelifera*, which therefore becomes a synonym.

Additional records.

56 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—Two, 10 and 15 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 700 fath.—One, 20 mm.; two, 13 and 14 mm.

Same station and date, townet at 600 fath.—One, 22 mm.

SUB-FAM. *BENTHEUPHAUSINAE*, H and T.GENUS **Bentheuphausia**, G. O. Sars.**Bentheuphausia amblyops**, G. O. Sars.*Bentheuphausia* sp., Holt and Tattersall, 1905 (1).

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Two, 14 and 18 mm.

In addition to the range mentioned in our previous communication, Hansen (1905 (1)) has added many records from the Bay of Biscay to the Canaries, and considers *B. amblyops* a common species in the area explored by the *Princess Alice* in 1904. Its presence, therefore, off the west of Ireland is not remarkable.

DIVISION PERACARIDA, Calman.

ORDER **MYSIDACEA**.FAMILY *LOPHOGASTRIDAE*, G. O. Sars.GENUS **Lophogaster**, M. Sars.**Lophogaster typicus**, M. Sars.*Additional records.*

30 mi. W.N.W. of Tearaght, Co. Kerry, 136 fath., February, 1905, coarse townet at 44 fath.—One, ovigerous female, 22 mm.

70 mi. S.W. of Fastnet, Co. Kerry, 81 fath., May, 1905, townet on trawl.—Thirty-three, 8 to 22 mm.; one, 30 mm.

In 1905 (1) we were able to record only a single example as the results of all the gatherings placed at our disposal. For some reason the species appears to be scarce on the Irish coast, but the capture of thirty-three in one haul suggests that it may be locally abundant. On the other hand, the record from 30 mi. off Tearaght, at 44 fath. in soundings of 136 fath., shows that *L. typicus* is by no means an essentially bottom-haunting form, and is therefore unlikely to be affected by any local conditions susceptible of narrow horizontal definition. However, while this capture presents, so far as we know, the first conclusive evidence of pelagic habit on our coasts, it is not enough to demonstrate that the species is at all phases of its career pelagic rather than benthic, nor is it impossible that the occurrence of the individual so near the surface was not induced by some unusual stratification of the medium. Lo Bianco (1901, p. 439) mentions the species as rarely caught in the upper strata in the Mediterranean.

The specimen is a gravid female, carrying young apparently just ready to leave the brood pouch. We are not aware of any previous description of this stage. It is, therefore, interesting to note that the larvae are of essentially the same type as those of an ordinary mysid at a corresponding stage of life-history, and in this respect bear testimony to the validity of the systematic association of the *Lophogastridae* and *Mysidae*.

GENUS *Gnathophausia*, Will.-Suhm.

Gnathophausia zoëa, Will.-Suhm.

Additional records.

40 mi. N. by W. of Eagle Island, Co. Mayo, 670 fath., February, 1905, townet at 540 fath.—Two, 50 and 65 mm.

Same station, townet at 630 fath.—Two, 45 and 50 mm.

50 mi., same course and date, 1,200 fath., townet at 700 fath.—One, 80 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl, at 700 fath.—Three, 26 to 60 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—One, 66 mm.

Same station, townet at 750 fath.—Two, 25 and 28 mm.

Records by Hansen (1905 (1)) from near the Azores and Canary Islands furnish additional proof of the very general distribution of this species in the north-east Atlantic. It is also known, as we have seen, from the tropical Atlantic and South Pacific.

FAMILY EUCOPIIDAE.

GENUS *Eucopia*, Dana, 1852.*Eucopia unguiculata* (Will.-Suhm).

- Chalaraspis unguiculata*, Will.-Suhm, 1875.
Eucopia australis (pars.), G. O. Sars, 1885.
Eucopia australis, Lo Bianco, 1903 and 1904.
Eucopia australis, Holt and Tattersall, 1905 (1).
Eucopia australis, Hansen, 1905 (1).
Eucopia unguiculata, Hansen, 1905 (2).
Eucopia australis, Holt and Tattersall, 1905 (2).
Eucopia unguiculata, Holt and Tattersall, 1905 (3).

Hansen (1905 (2)) has shown that the forms which Sars (1885) described as *E. australis*, Dana, comprise more than one species, and that those of them which were described by Willemoes Suhm as *C. unguiculata* are distinct.

Though it is possible that Suhm, who died before he had an opportunity of revising his preliminary diagnoses of the *Challenger* crustacea, may have included more than one species in *C. unguiculata*, his description appears to be sufficiently exact to apply to the common Atlantic form, to which belong all which we have previously recorded as *E. australis*. The same may apply, we suppose, to some of the *E. australis* of the *Albatross* (Faxon, 1895). *E. unguiculata* is widely distributed in the Atlantic, and extends into the Mediterranean (Lo Bianco, 1903). It occurs also in the Pacific about the East Indies [Hansen, 1905 (2), p. 4].

Additional records.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, tow-net at 500 fath.—Three, fragmentary, ca 20 mm.

Same station and date, tow-net at 700 fath.—One, 22 mm.

40 mi. N. by W. of Eagle Island, Co. Mayo, 670 fath., February, 1905, tow-net at 630 fath.—Four, 14 to 30 mm.

Same station and date, tow-net at 500 fath.—One, 15 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 360 fath., May, 1905, tow-net on trawl.—One, 15 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl at 700 fath.—Forty-three, 13 to 30 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Thirty-two, 15-35 mm.

Same station and date, coarse tow-net at 750 fath.—Eight, 25 mm.

***Eucopia sculpticauda*, Faxon, 1895.**

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, Petersen trawl at 700 fath.—One, 29 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl, at 1,150 fath.—One, 46 mm.

The geographical range of this species is extensive. Faxon records it from the tropical Pacific near the coast of Central America, and Alcock from the Indian Ocean. Hansen mentions it from the Atlantic Ocean near the Azores and the Canary Islands, and its occurrence, as above indicated, within the 1,000 fathom line on our own coast seems to point to a general north-east Atlantic range. *E. intermedia* (Hansen, 1905 (1)) is a closely allied species as yet only known from a single immature specimen taken near Madeira. Its occasional occurrence within our area appears probable.

FAMILY PETALOPHTHALMIDAE, nov.

Carapace membranaceous, short and imperfectly developed, leaving the last two thoracic segments quite free.

Eyes (first cephalic appendages) without visual elements, lamellar or spiniform (or absent?).

First thoracic limbs devoid of exopods but furnished with well developed epipods. An internal lamelliform lobe present on the merus in some genera.

Second thoracic limbs with an internal lamelliform lobe on the merus. Exopods present or absent.

Third to last thoracic limbs with well developed exopods.

Female with seven pairs of incubatory lamellae.

Inner uropods without otocyst.

In instituting this family we have only given definite expression to the suggestions of Faxon (1895) and Hansen (1887) when dealing with some of the genera which it is intended to embrace. Among which, of other families of the *Mysidacea*, its nearest relatives may be sought, is a problem upon which we can form no definite opinion. It is, however, of interest to note that while the eyes in all members of the family happen to be without visual function, this peculiarity is not one of the characters essential to its separation. Among the *Mysidae* occur instances of closely allied genera in which the first cephalic appendages are respectively organs of vision or sightless processes (*e.g.* *Erythrops* and *Pseudomma*) while within the limits of a single genus may be found those which see and those which see not (*e.g.*, *Boreomysis*, *Mysidella*); but, blind or seeing, the *Mysids* present no near approach to the *Petalophthalmids* in those characters which more saliently

distinguish the latter. We may, therefore, be right in supposing that the *Petalophthalmidae* have not diverged from the general Mysidacean type, or at least from true *Mysidae* in response to variation associated with the loss of the visual sense, but became separated from the remaining families by a process of variation in which the change of the first cephalic appendage played at most a subsidiary part.

The following key for the identification of the genera grouped in this family may be useful :—

A. First and second pairs of thoracic limbs devoid of exopods.

(i.) First thoracic limbs (maxillipedes) with internal lamelliform meral lobe.

Petalophthalmus, Will.-Suhm.

B. First pair of thoracic limbs alone devoid of exopods, second pair with exopods well developed.

(i.) First thoracic limbs (maxillipedes) with internal lamelliform meral lobe.

Ceratomyxis, Faxon.

(ii.) First thoracic limbs (maxillipedes) without internal lamelliform meral lobe.

(a.) Rostrum prominent, eyestalks spiniform.

Scolophthalmus, Faxon.

(b.) Rostrum obsolete, eyes leaf-like (or absent?).

Hansenomyxis, Stebbing.

As noted by Faxon and Hansen, the form described by Willemoes Suhm as the female of *Petalophthalmus armiger*, does not belong to any of the *Petalophthalmid* genera, but is a *Boreomyxis* (? *B. scyphops*.)

GENUS *Petalophthalmus*, Will.-Suhm.

Petalophthalmus armiger, Will.-Suhm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—One, 15 mm.

The specimen, though not in the best condition, agrees fairly well with the descriptions of Suhm and Sars. We note, however, that all the spines on the apex and some of those on the lateral margins of the telson are plumose, or rather armed on each side with a very closely set row of minute sharp spinules, and that between the median spine of the apex and the nearest spine on each side there are three spinules. The antenna has, besides the peduncle, a short, very slender flagellum, consisting of six joints and terminated by a pair of setae; it is not much longer or stouter than the setae arising from the end of the peduncle.

There are no incubatory lamellae, but the specimen is perhaps too small to show sexual characters. The pleopods are uniramous; the distal joint has a general resemblance to the inner ramus depicted by Sars in his male specimen of 40 mm., but is rather narrower.

Previous records comprise one male (Will.-Suhm) from $2^{\circ} 25' N.$, $20^{\circ} 1' W.$, 2,500 fath., and one female (Faxon), $24^{\circ} 36' N.$, $84^{\circ} 5' W.$, 955 fath. *P. armiger* is therefore known only from the temperate and tropical parts of the Atlantic. It seems to be a pelagic animal, apparently confined to strata remote from the surface.

FAMILY MYSIDAE.

SUB-FAM. *LEPTOMYSINAE*, Norman.

GENUS *Erythrops*, G. O. Sars.

Erythrops serrata, G. O. Sars.

Additional records.

50 mi. W.N.W. of Slyne Head, Co. Galway, 112 fath., August, 1904, tow-net on trawl.—Twenty, small.

80 mi. same course, 180 fath., August, 1904, tow-net on trawl.—Sixteen.

81 mi. W. of Eagle Island, Co. Mayo, 220 fath., August, 1904, tow-net on trawl.—One.

40 mi. W.N.W. of Tearaght, Co. Kerry, 244 fath., November, 1904, tow-net on dredge.—One, 7 mm.

Porcupine Bank, Lat. $53^{\circ} 39' N.$, Long. $12^{\circ} 24' W.$, 185 fath., May, 1905, tow-net on trawl.—Five, 7 to 9 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 1' N.$, Long. $14^{\circ} 34' W.$, 293 fath., May, 1905, tow-net on trawl.—Twenty-eight, 6 mm.

Porcupine Bank, Lat. $53^{\circ} 2' N.$, Long. $13^{\circ} 48' W.$, 105 fath., May, 1905, tow-net on trawl.—Two, 9 mm.

Porcupine Bank, Lat. $53^{\circ} 20' N.$, Long. $13^{\circ} 0' W.$, 164 fath., May, 1905, tow-net on trawl.—Seven, 10 mm.

GENUS *Meterythrops*, S. I. Smith.

Meterythrops picta, H. & T.

Additional records.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, tow-net at 700 fath.—One, 5 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 1' N.$, Long. $14^{\circ} 34' W.$, May, 1905, 293 fath., tow-net on trawl.—Two, 5 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, Petersen trawl at 700 fath.—One, 12 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—One, 8 mm.

M. picta is otherwise known only from the single example recorded in our previous communication. Altogether, six have now been taken, all off the west coast of Ireland, at soundings

which range from 293 to 1,200 fath., but at distances from the surface which in no case exceed 700 fath. The species appears to be most probably pelagic, and not, as we were at first inclined to suppose, confined to the neighbourhood of the bottom.

The fully developed adult of either sex is not known. Young examples of 5 mm. lack the serration of the antennal scale characteristic of later stages. They thus resemble young *Parerythroptera* rather closely, but may be distinguished at once by the relatively larger size and pale golden colour of the eye, which in *Parerythroptera* is reddish brown and much darker. Even the youngest *M. picta* have the deep brown body pigment noted in our description of the type.

GENUS **Katerythroptera**, H. & T., 1905 (1) & (2).

Katerythroptera Oceanae, H. & T.

Additional record.

W. of Poreupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl at 700 fath.—One, 8 mm.

This specimen is an adult male. The pleopods, as we surmised in diagnosing the species from an immature example, are as in *Meterythroptera*. The antennal scale retains the proportional size and character of the type, and the telson is devoid of median setae. The antennular brush of setae is as usual in the genera allied to *Erythroptera*. Our diagnosis, therefore, requires only the statement of size of adult, viz., 8 mm.

Hansen's records (1905 (1)) are from the neighbourhood of the Azores and Canary Islands. The species appears to be truly pelagic, and may be suspected to have a fairly wide distribution in the Atlantic.

GENUS **Hypererythroptera**, H. & T.

Hypererythroptera serriventer, H. & T., 1905 (1).

Additional records.

80 mi. W.N.W. of Slyne Head, Co. Galway, 180 fath., August, 1904, townet on trawl.—Two, fragmentary.

Poreupine Bank, Lat. 53° 39' N., Long. 12° 24' W., 185 fath., May, 1905, townet on trawl.—Six, 9 to 11 mm.

Poreupine Bank, Lat. 53° 20' N., Long. 13° 0' W., 164 fath., May, 1905, townet on trawl.—One, 8 mm.

GENUS **Parerythroptera**, G. O. Sars.

Parerythroptera obesa, G. O. Sars.

? *P. abyssicola*, G. O. Sars.

We are unable to find any definitely marked and constant character whereby *Parerythroptera obesa* may be distinguished from *P. abyssicola*. The only marked difference between the

two species to be gleaned from descriptions and figures is the comparative size of the eye. In *P. obesa* the greatest breadth of the pigmented part of the eye is shown to be greater than the greatest breadth of the telson, while in *P. abyssicola* the reverse condition is depicted. The eye is, however, such a fragile structure and so very liable to injury and contraction that characters derived from its form and dimensions alone are not of very much value for specific distinction. In the specimens before us, all of which we refer to *Parerythrope obesa*, none have the eyes in perfect condition. In consequence we are unable to obtain among them a constant relation between the breadth of the telson and the greatest breadth of the pigmented portion of the eye. Apart from the supposed differences in the comparative size of the eyes, there is no other sufficiently well-marked character to separate the two species. We therefore suggest that it is highly probable that they are identical, the differences in the size of the eye being due to differences of preservation. We may note in addition that the vertical range of both species is the same.

Additional records.

77 mi. W. of Achill Head, Co. Mayo, 382 fath., August, 1901, townet on dredge.—One, 9 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 14° 15' W., 500 fath., May, 1905, townet on trawl.—Two, 7 and 9 mm.

Distribution.—This species is among those added to the fauna of the Mediterranean by Lo Bianco (1903).

GENUS *Euchaetomera*, G. O. Sars.

Euchaetomera Fowleri, H. & T.

Euchaetomera tenuis, Lo Bianco, 1903.

The range of this species, first taken by Fowler off the Bay of Biscay, has now been extended by records from south of the Azores (Hansen, 1905 (2)), from off the west coast of Ireland (see below) and from the Mediterranean (as *E. tenuis*).

By a clerical error in our diagnosis (1905 (1), p. 123), the antennular peduncle is said to be about one and a half times as long as the eye. It is to the proximal joint of the peduncle that this statement of length is really applicable.

The imperfect condition of the posterior thoracic limbs of our female type (*op. cit.*, p. 124) proves, as we supposed, to be individual and not specific in character. It may perhaps be associated with the regeneration of lost parts.

Additional records.

50 mi. W.N.W. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—One, 11 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 15° 6' W., 860 fath., May, 1905, Petersen trawl at 700 fath.—One, 8 mm.

Dr. Lo Bianco very kindly sent us the Mediterranean form which he has recorded as *Euchaetomera tenuis*. This, taken off Pt. Tragara at 1,100 m., is a somewhat imperfect example of *E. Fowleri*.

Two Mysids* (apparently from 100 m., off Capri, and from 1,000 m., off Pt. Carena) though very closely resembling *E. tenuis* in some respects cannot be included in the genus as at present defined on account of the character of the antennal scale. The scale is narrow and tapering, extends somewhat beyond the extremity of the antennular peduncle and is sparsely setose on both margins with a narrowly rounded apex. The eyes, absent from one specimen, are injured in the other, but were certainly bilobate when perfect. The telson is of about the same size and shape as in *E. tenuis*, but the apical part is broader and more convex in outline than in Sars' drawings of that species. At each angle of this part is a small prominence which in one specimen still bears a small fine spine much like one of the angular spines of *E. Fowleri*. The median setae, which are plumose and very long and stout, are set at about the same distance from each other as in *E. typica* and *E. Fowleri*, and therefore much further apart than in Sars' drawing of *E. tenuis*. The male, which has the antennular brush of setae well developed, has the outer rami of the second to fifth pleopods much shorter, not so much jointed, and less setose than the inner. The total length is about 7.5 mm.

GENUS *Amblyops*, G. O. Sars.

Amblyops abbreviata, G. O. Sars.

Additional record.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—Four, 13 to 15 mm.

GENUS *Paramblyops*, H. & T.

Paramblyops rostrata, H. & T.

Additional records.

80 mi. W.N.W. of Slyne Head, Co. Galway, 180 fath., August, 1904, townet on trawl.—One, fragmentary.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 6 mm.

W. of Porcupine Bank, Lat. 53° 1' N., Long. 14° 34' W., May, 1905, townet on trawl.—One, 6 mm.

* These specimens, having been labelled *E. tenuis*, by inadvertence, were sent to us with the *E. Fowleri*, but do not appear in the record.

GENUS *Pseudomma*, G. O. Sars.*Pseudomma affine*, G. O. Sars, 1870.

Pseudomma roseum, Holt and Tattersall, 1905 (1), *nec* Sars, 1870-79.

Pl. III., Figs. 1-6.

Pseudomma roseum must be expunged from the list of British and Irish mysids, since the specimens which we so named in our previous communication have proved, on re-examination, to be *P. affine*.* They are not, however, in perfect agreement with Sars' description and figures, and had we not obtained from Canon Norman the loan of some of Sars' co-types of *P. affine* we should have burdened the genus with a spurious species.

Dr. Scharff was kind enough to place at our disposal specimens of *P. roseum* named by Sars himself, with whose diagnosis and drawings (1870-79) they are in the most exact agreement. *P. roseum*, moreover, is a larger animal, as will appear.

The creature has given us so much trouble, that to save others from the same, we propose a rather lengthy discussion of its characters. Norman's co-types being in agreement with Irish examples we should, from the material we have seen, diagnose the species as follows:—

Form compact, sublinear in shape. *Carapace* wider than pleon; emarginate posteriorly so as to leave the last thoracic segment exposed; front margin evenly rounded. *Pleon* longer than carapace; first five segments subequal in length; last segment about twice as long as fifth segment. *Ocular lamina* (composed of two sub-rectangular contiguous plates) barely extending to the distal end of basal joints of antennular peduncle; slightly cleft in the middle line, slightly hispid in central region, armed on each side with about thirty lateral denticles extending from the antero-lateral angles to the extreme hind ends of the lateral margins. Anterior margin only very slightly produced in the middle line in the female, not produced in the male. Antero-lateral angle strongly developed in the male, not in the female. *Antennular peduncle* with first and third joints subequal in length in female, second joint shorter; in male third joint longer than first. *Antennal peduncle* about as long as antenular peduncle

* The error was mine, since by an oversight, confined to this form, Mr. Tattersall had no opportunity or revising my preliminary determination before our paper went to press (E. W. L. H.).

in female, a little shorter in male; its two last joints subequal in length. *Antennal scale* extending for about half its length beyond antennal peduncle, about three times as long as broad, apical part obtusely rounded at tip and extending beyond terminal spine of outer margin for a distance varying from one-fourth to one-third of total length of scale. Spinous process external to articulation of scale strongly developed. *Mouth parts, thoracic legs and pleopods* not differing from *P. roseum* in any important particular. *Telson* very slightly shorter than sixth segment of pleon; apex entire, broadly rounded, armed with a pair of median setae and with usually four, occasionally five, and very rarely six pairs of spines—median pair about one-quarter the length of telson, second and third pairs slightly shorter than median, fourth (and fifth and sixth, if present) pair small. Lateral margins armed with three (rarely less) to seven spines. *Uropods*, outer about half again, inner about a quarter again as long as telson; no spines on ventral surface of inner. *Length* 12 mm., males adult at about 10 mm.

P. affine, as we know it, departs from the account conveyed by Sars' diagnosis and figures, especially in the following particulars:—

- (i.) The antennal scale never has the part distal to the terminal spine of the outer margin of a greater length than one-third of the total length of the scale. Sars (1870, Pl. V., Figs. 13, 16, 20) depicts it somewhat longer.
- (ii.) The eye-plate of the female has the median extremity distinctly less produced than in Sars' figure (Pl. V., Figs. 13, 15.).
- (iii.) Sars gives the number of pairs of spines on the apex of the telson as five to six. We think four is the normal number; five appear to occur only occasionally, and six pairs we regard as quite exceptional. We have one specimen which has three on one side, four on the other.

We have critically examined thirty-two specimens from different localities, and of these twenty-eight which have the telson quite perfect give the apical spine formula thus:—

One specimen,	seven spines (asymmetrical).
Twenty-two specimens, . .	four pairs.
Four specimens,	five pairs.
One specimen,	six pairs.

In other words, four pairs of apical spines occur in about eighty per cent. of specimens. In a cursory examination of over seventy we have found no other example possessing six pairs, though asymmetry is not rare.

The variations in particulars of antennal scale and telson are set forth below in tabular form.

Pseudomma affine, G. O. Sars.

TABLE showing variations in telson and antennal scale.

The abbreviation "br." signifies "broken."

Locality of capture of specimens.	Length in mm.	Spines arming telson.			Proportion of part of antennal scale beyond outer terminal spine to total length of scale.
		Left.	Right.	Apical.	
50 miles W.N.W. Cleggan, co. Galway. 120 fathoms. Townet on trawl.	8	br.	br.	br.	1:3
	7	6	6	8	1:3
	5	3	3	8	broken.
Porcupine Bank. 185 fathoms. Lat., 53° 39' N., Long., 12° 24' W. Townet on trawl.	7	5	3	10	4:19
	7	6	4	10	4:18
	7	5	5	10	1:4
	7	5	5	8	3:11
W. of Porcupine Bank. 500 fathoms. Lat., 53° 7' N., Long., 14° 50' W.	9	1	2	10	1:4
40 miles W.N.W. Tearaght, co. Kerry. 244 fathoms. Townet on trawl.	9	br.	br.	br.	1:3
	8	6	6	8	2:7
	8	8	5	8	7:24
	8	5	7	8	7:23
	7	7	6	8	1:4
	(6 tails)	5	5	8	3:11
		5	6	8	
		6	5	8	
		4	3	8	
		4	4	8	
	(5 heads)	7	5	8	
50 miles W. of Achill Head. 190 fathoms. Townet on trawl.	9	5	5	12	1:4
	9	3	3	8	7:29
	8	br.	br.	br.	5:23
Lambay Deep. 65 fathoms. Townet on trawl.	8	5	4	8	6:19
	7	4	3	7	4:11
	7	4	4	8	2:7
	7	4	4	8	3:10
	7	5	5	8	broken.
	7	6	6	8	2:7
	6	br.	br.	br.	5:18
	5	4	4	8	4:15
Co-types of <i>P. affine</i> , Sars., received from Cagn Norman.	10	4	5	8	9:31
	10	5	5	8	broken.

From *P. roseum* it is easy to distinguish *P. affine* by the following characters:—

Eye plate.—In *P. affine* the denticulations cover the whole lateral margins. In *P. roseum* they scarcely extend beyond the antero-lateral angles.

Antennal scale.—In *P. affine* the length of the apical part is generally about a quarter, and never more than a third, of the total length of the scale. In *P. roseum* the apical is generally about a half and always more than a third of the total length of the scale.

Telson.—In *P. affine* there are at least four apical spines on one side or the other of the telson. In *P. roseum* the number of apical spines has not been observed to exceed two pairs.

Size.—*P. affine* has not been observed to exceed 12 mm., and in Irish waters at least is mature (male) at 10 mm. *P. roseum* attains or exceeds 15 mm., and we suppose that the male is not mature at 10 mm.

P. truncatum, S. I. Smith, has the antennal scale much as in *P. affine*, but the eye-plate and telson are quite distinctive. Specimens kindly communicated by Professor Smith and Canon Norman enable us to speak on this point with reference to the actual animal as well as to its presentments in literature.

Other species of *Pseudomma* appear to present no obvious opportunity of confusion with *P. affine*.

Additional records.

Porcupine Bank, Lat. 53° 39' N., Long. 12° 24' W., 185 fath., May, 1905, townet on trawl.—Four, 7 to 8 mm.

W. of Porcupine Bank, Lat. 53° 7' N., Long. 14° 50' W., 500 fath., May, 1905, townet on trawl.—One, 9 mm.

P. affine has also been taken by the *Helga* in the Irish Sea at 65 fath. Its known horizontal range is, therefore, Norway to coasts of Ireland, the vertical range being 65 to 500 fathoms. The Mediterranean species recorded as *P. affine* by Lo Bianco is really *P. calloplura*.

***Pseudomma calloplura*, H. & T.**

Pseudomma calloplura, H. and T., 1905 (1).

Pseudomma affine, Lo Bianco, 1903, *nec* Sars.

Pl. IV., Figs. 1-5.

Form sublinear, compact, carapace not much wider than the pleon, emarginate posteriorly, evenly rounded anteriorly, *Pleon* with the first five segments subequal, the sixth one and a half times as long as the fifth. *Ocular lamina* large, with a short cleft in the median dorsal line, each part sub-rhomboidal in shape, about one and a quarter times as broad as long, with

a more or less prominent angle near the outer distal corner, the margins from the (antero-lateral) angle throughout the whole lateral edge on each side armed with about twenty-five teeth. *Antennular peduncle* rather stoutly built and feebly armed, male appendage well developed and densely hirsute. *Antennal peduncle* shorter than the antennular peduncle, with the last two joints subequal, feebly armed. *Antennal scale* about four times as long as broad, and about twice as long as the antennal peduncle, extending for about one-third of its length past the antennular peduncle, external margin entire, terminating in a short spine, tip of the scale rather obtuse and not extending beyond the terminal spine. *Mandible* as usual for the genus, but with the second joint of the palp rather broader than in the type species. *First and second maxillae* of the usual structure and form. *First thoracic legs* rather small, with the carpus as long as the merus, propodus very short, nail distinct and much longer than the propodus, merus and the two preceding joints armed on their inner edges with plumose setae, the merus having, in addition, ordinary setae, the carpus armed with a few simple setae, the propodus similarly armed to the carpus. *Second thoracic legs* relatively shorter than in the type species, with the merus slightly longer than the carpus, propodus very small, nail distinct and longer than the propodus; latter armed with about five plumose setae at its tip in addition to a few simple setae, not nearly so densely armed as in the type species; remaining joints feebly armed with simple setae only. *Endopods* of the remaining thoracic limbs missing in the type specimens. *Exopods* of the thoracic limbs well developed, those of the first and second limbs longer than the endopods, outer distal corner of the basal joint slightly acuminate, flagelliform part of ten joints. *Pleopods* of the female as usual for the genus, those of the male well developed, natatory, inner branch of the first pair a short rounded lobe armed at the tip with three setae and with three setae near its base, lateral lobe rather narrow with two setae at its tip; second, third, and fifth pleopods of the male consisting of two equal multiarticulate branches, the inner branch with the usual lateral lobe; fourth pair of pleopods of exactly the same structure as the others but with the outer branch terminating in a very long strong seta, quite simple and longer than the whole pleopod itself. *Telson* as long as the last segment of the pleon, lateral margins straight, whole telson gradually narrowing to its apex, latter broadly rounded, entire, armed with three (? sometimes four) pairs of equal spines, which are about one-fifth of the length of the telson, and are adorned on each side with a closely set row of minute spinules or setae; median setae absent; lateral margins armed with about thirteen short spines occupying the distal two-thirds of the margin. *Inner Uropods* about one and a quarter times as long as the telson, ciliate all round, with a single spine at the inner posterior corner of the otocyst. *Outer uropods* about one and a third times as long as the inner and broader than the latter. *Length*, 10 mm.

In a Mediterranean specimen communicated by Dr. Lo Bianco, the telson has on the right side fourteen simple lateral and three plumose apical spines, while on the left side the numbers are thirteen and four, one of the normally lateral spines having become enlarged and plumose.

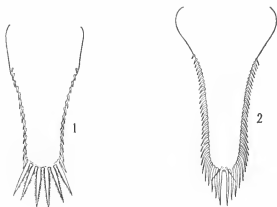


FIG. 1.—Telson of *Pseudomma calloplura*.

„ 2.—Telson of *Pseudomma Kempi*.

Including *P. nanum*, nine species of *Pseudomma* are now known. Of these species four—*P. calloplura*, *P. Théeli*, Ohlin, *P. parva*, Vanhöffen, and *P. Kempi* are distinguished from the rest by the shortness of the apex of the antennal scale, which does not extend beyond the terminal spine of the outer margin. From *P. Théeli*, *P. calloplura* is readily distinguished by the form of the ocular lamina, which in the former species is described as without any trace of median cleft, and triangular in shape. A further point of distinction lies in the armature of the telson. In *P. Théeli* the terminal spines are not plumose, while the spines arming the lateral margins are very few in number and confined to the extreme posterior part. From *P. Kempi*, *P. calloplura* is distinguished by the absence of median setae and by the plumose character of the spines at the apex of the telson, and by the fewer and shorter spines arming the lateral margins of the telson. The

armature of the eye is also another distinguishing point. With *P. parva*, the present species may be identical. *P. parva* was very imperfectly described by its discoverer, and has never to our knowledge been figured. It has three pairs of spines and no median setae on the apex of the telson. Nothing is said as to whether the terminal spines of the telson are plumose or not, and these are such a striking feature of *P. calloptura* even under a moderately low power of the microscope, that had they been similarly plumose in *P. parva* this fact would hardly have escaped notice and mention. We hesitate to unite the two species, especially as *P. calloptura*, as will be seen from the above description, presents many unusual features. Chief among these is the character of the pleopods in the male. The first pleopods, with their feebly armed inner ramus, recall the condition seen in *Amblyops* rather than *Pseudomma*, while the long seta which terminates the outer branch of the fourth pair only, finds its parallel among the *Leptomysinae* in the genus *Mysidopsis*, where, however, the seta is much shorter and plumose, while in *P. calloptura* it is quite simple and very long. The first and second thoracic legs, further, differ from the type species of the genus, *P. roseum*, in having the propodus very small, and the nail quite distinct and rather long, thus again agreeing closely with *Amblyops*. The details of armature of these limbs are also more in accordance with those found in *Amblyops* than in *Pseudomma*. The character of the ocular lamina in *P. calloptura*, however, places this species in the genus *Pseudomma*. Though a slight dorsal cleft is noticeable, as, indeed, it is in the type species, the lateral elements of the lamina are otherwise perfectly contiguous.

Additional records.

54 mi. W.N.W. of Tearaght, Co. Kerry, 454 fath., November, 1904, townet on trawl.—Four, 9 to 10 mm.

50 mi., same course, 372 fath., February, 1905, townet on trawl.—Four, 8 to 10 mm.

50 mi., same course, 360 fath., May, 1905, townet on trawl.—Nine, 7 to 9 mm.

Under the name of *P. affine*, Lo Bianco (1903) indicated the occurrence of this species in the Mediterranean.

***Pseudomma Kempi*, H. & T.**

P. Kempi, Holt and Tattersall, 1905 (1).

Pl. IV., Figs. 6-10.

Form robust, compact, sublinear in shape. *Carapace* not much wider than pleon, emarginate posteriorly, evenly rounded in front, cervical sulcus well marked. *Pleon* with the first segment longer than the next four, which are sub-equal in length, last segment about twice as long as the preceding. *Ocular lamina* slightly cleft in the middle dorsal line, composed of

two sub-rectangular contiguous plates; rather large, minutely hispid all over; teeth about twelve in number, confined to the antero-lateral corners. *Antennular peduncle* short and very stoutly built; basal joint with its outer corner produced into a process tipped with setae; second joint remarkably short; third joint roughly cubical in shape, as long as the other two combined, with a few setae on its inner edge and inner distal corner. *Antennal peduncle* comparatively short and more slender than the antennular peduncle; third joint slightly longer and narrower than the second; both second and third joints with setae at their inner distal corners. *Antennal scale* about twice as long as the antennal peduncle, extending for about half its length past the antennular peduncle; about three times as long as broad in its widest part; outer margin entire, terminating in a prominent spine; apex of scale bluntly rounded and not extending beyond the terminal spine. *Mandible* of the usual form, but with the second joint of the palp wider than usual. *First and second maxillae* as in the type species. *First thoracic legs* rather short, merus equal in length to the carpus, propodus small, nail distinct and longer than the propodus; merus and two preceding joints armed with strong plumose setae, carpus armed with simple setae only, about four plumose setae on the propodus. *Second thoracic legs* moderately slender, with the carpus equal to the merus, propodus very small, nail quite distinct and longer than the propodus, a few plumose setae on the propodus, the remaining joints with a few scattered simple setae. *Exopods* of all the thoracic limbs well developed; outer distal corner of the basal joint slightly acuminate; flagelliform part of about ten joints. *Telson* as long as the last segment of the pleon, massive and well armed, tapering slightly to a broadly rounded entire apex armed with a median pair of minute spinules (which often appear as a single spinule with a bifid tip), a median pair of plumose setae arising anterodorsally to the above, and two pairs of spines, rather long and slender, the inner and longer pair of which are about one-sixth the length of the telson proper; lateral margins, from the level of the otocysts, each with about twenty-eight to thirty spines increasing in length towards the apex. *Inner uropods* about one and a sixth times as long as the telson, with a single spine on the inner posterior corner of the otocyst. *Outer uropods* about one and a half times as long as the telson, broader than the inner uropods. *Length* of an apparently adult female, 11 mm.

In describing *P. calloplura* we called attention to the rather marked differences which existed between the first and second thoracic legs of that species and those of the type form *P. roseum*, noting that the condition there seen showed closer resemblance to the genus *Amblyops* than to *Pseudomma*. These differences are to be found in the extreme shortness of the propodus and the length and distinctness of the nail, as well as in the armature. *P. Kempfi* has the first and second thoracic legs of exactly the same type as *P. calloplura*. The

two species are very closely allied, and further points of agreement between them are to be seen in the shape of the antennal scale, in the comparative breadth of the second joint of the mandibular palp and in the presence of a single spine at the inner posterior corner of the otocyst. They differ from each other in the relative length and stoutness of the antennular peduncle, and in the armature of the eye. In *P. calloptura* the eye is smooth and has teeth along the whole of its lateral edge. In *P. Kempi* the eye is distinctly hispid, and the teeth are confined to the anterolateral corner. Further, in *P. calloptura* the last segment of the pleon is only one and a half times as long as the preceding segment, whereas in *P. Kempi* it is twice as long. Finally, the telsons of the two forms are very distinct, *P. Kempi* differing from *P. calloptura* in possessing a median pair of plumose setae and small spinules, in the non-plumose character of the terminal spines, and in the larger number and greater length of the spines arming the lateral margins. A comparison between the pleopods of the males of each species is, unfortunately, not possible, the only fragment of a male of *P. Kempi* which is available having the pleopods evidently in an immature state of development. This fragment measures 7 mm. in length, and we judge that the total length of the complete specimen must have been at least 10 mm. Of the pleopods exhibited by this fragment all except the first have the inner ramus longer than the outer, while both branches of all are imperfectly articulate, with the setae sparingly or not at all developed. It is impossible at present to say whether the peculiar condition of the fourth pair of pleopods noticed in the male of *P. calloptura* obtains also in *P. Kempi*, but this is quite likely in view of the close resemblance in other characters.

***Pseudomma nanum*, sp. n.**

Pl. III., Figs. 7-10.

Form compact, sublinear in shape. *Carapace* little wider than the pleon, emarginate posteriorly, evenly rounded in front. *Pleon* longer than the carapace, with the first five segments subequal in length, the last segment once and a half to once and two-thirds as long as the fifth. *Ocular lamina* slightly cleft in the middle line, composed of two sub-rectangular contiguous plates; extending to barely the distal ends of the basal joints of the antennules, each plate exhibiting near the mid-dorsal line a rather prominent corner, which is much more pronounced in the male than in the female; plates hispid, armed on the anterolateral margins with about fifteen teeth, lateral margins smooth. *Antennular peduncle* in the female moderately slender, basal joint the longest, nearly as long as the other two combined; second joint small, whole peduncle feebly setose; in the male much stronger and longer, distal joint nearly as long as the basal, male appendage well developed and very hirsute. *Antennal peduncle* slender, in

the female shorter than the antennular peduncle, last two joints subequal; in the male longer and more slender than in the female, as long as the antennular peduncle, the last joint somewhat longer than the second. *Antennal scale* comparatively short and narrow, in the female extending for only a little way, in the male not extending beyond the antennular peduncle, about four times as long as broad, outer margin entire terminating in a strong spine, apex obtusely rounded and almost imperceptibly extending beyond the outer terminal spine. *Mouth parts* of the usual type found in the genus. *First thoracic legs* very much as described for *P. calloptura*, with, however, the carpus shorter than the merus, propodus short, nail well developed, distinct and longer than the propodus; setae as in *P. calloptura*. *Second thoracic legs* much as in *P. roseum*; carpus shorter than merus; the propodus much better developed than in either *P. calloptura* or *P. Kempfi*, and densely armed with both simple and plumose setae; nail distinctly present but small, shorter than the propodus and hidden among the setae of the propodus. *Exopods of all the thoracic limbs* well developed, outer distal corner of the basal joint slightly acuminate, flagelliform part of eleven joints. *Pleopods* of the female of usual structure, those of the male well developed, biramous, natatory, of the type met with in *P. roseum*; inner branch of the first pair with a single long seta at its tip, and three or four on its inner edge, lateral lobe well developed and tipped with two or three long setae. *Telson* as long as the last segment of the pleon, base nearly three times as broad as apex; apex broadly rounded, entire, armed with a pair of median setae and four pairs of strong simple spines, the innermost pair the longest, about one-quarter the length of the telson, each succeeding pair shorter than its inner neighbour; lateral margins unarmed. *Inner uropods* once and a quarter, outer uropods once and a half the length of the telson; no spine at the base of the inner uropod. *Length* of the type female 8 mm., of the type male (adult) 6.5 mm.

Though the type male only measures 6.5 mm., the brush on the antennules is very well developed, as are also the pleopods. This would seem to indicate that *P. nanum* is a small species compared with most other members of the genus. It is at once distinguished from all its congeners by the unarmed lateral margins of the telson. Otherwise it approaches rather closely to *P. Sarsi* described from the *Challenger* collections from near Kerguelen. *P. Sarsi* has, however, distinct though small spines on the lateral margins of the telson. The shape of the antennal scale is the same in both species and unlike that seen in any other member of the genus.

The first two thoracic legs of *P. nanum* show a rather intermediate stage between the type form *P. roseum* and *P. calloptura*. The first thoracic leg agrees in all essential particulars with that described and figured by us for *P. calloptura*. The second thoracic leg, however, approaches more nearly to the condition seen in *P. roseum* in having the propodus well

developed and densely setose. The nail is, however, quite distinctly developed though quite small. The third to eighth legs are missing in all our specimens, both of *P. nanum* and *P. calloplura*.

The sexual difference noted above in the proportional length of the antennal peduncle has not, we believe, been noticed in any other mysid.

We append a table for the ready identification of the known British-and-Irish species of *Pseudomma*.

I. Lateral margins of the telson armed with more or fewer spines.

A. Antennal scale with the outer margin terminating in a spine, apex of the scale *not* extending beyond the outer terminal spine.

(i.) Telson armed at apex with about three pairs of plumose spines, median setae absent, lateral margins with about thirteen small spines; eye plate with teeth throughout the antero-lateral and lateral edges.

P. calloplura, H. and T.

(ii.) Telson armed at apex with about two pairs of simple spines, and a median pair of small spinules, median setae present, lateral margins with about twenty-eight spines; eyeplate with teeth confined to the antero-lateral corner.

P. Kempi, H. and T.

B. Antennal scale with the outer margin terminating in a spine, apex of the scale extending *far* beyond the outer terminal spine.

Telson armed at apex with about four pairs* of simple spines, median setae present, lateral margins armed with about three to seven spines; eye plate with teeth throughout the antero-lateral and lateral margins.

P. affine, G. O. Sars.

II. Lateral margins of the telson unarmed.

Antennal scale with the outer margin terminating in a spine, apex barely extending beyond the outer terminal spine.

Telson armed at its apex with about four pairs of simple spines, median setae present, eye plate with teeth confined to the antero-lateral corner.

P. nanum, H. and T.

Records of P. nanum.

60 mi. W. of Achill Head, 199 fath., August, 1901, tow-net on trawl.—One, 5 mm.

* The spines, as in all *Mysidae*, are not rarely asymmetrical in distribution. The total number observed on the apex varies from seven to twelve (see p. 28).

48 mi. W.N.W. of Tearaght, Co. Kerry, 337 fath., November, 1904, townet on trawl.—Nineteen, 6 to 8 mm.

50 mi. same course, 372 fath., February, 1905, townet on trawl.—Eight, 6 to 9 mm.

50 mi. same course, 360 fath., May, 1905, townet on trawl.—Three, 7 mm.

GENUS *Mysidopsis*, G. O. Sars.

Mysidopsis didelphys, Norman.

Additional records.

50 mi. W.N.W. of Cleggan, Co. Galway, 120 fath., August, 1904, townet on dredge-bridle.—One, 7 mm.

Porcupine Bank, Lat. $53^{\circ} 20' N.$, Long. $13^{\circ} 0' W.$, 164 fath., May, 1905, townet on trawl.—One, 12 mm.

GENUS *Mysideis*, G. O. Sars.

Mysideis insignis, G. O. Sars.

Mysidopsis hibernica, Norman, 1892.

The examination of further material has convinced us that *M. insignis* and *M. hibernica* cannot be regarded as specifically distinct. They are one species in which the apex of the telson may exhibit an emargination which varies, without regard to size of individual, from the merest indentation to a distinct but small and narrow cleft. The cleft is never denticulate, and the median setae are on the ventral face of the telson somewhat anterior to its postero-median margin. The lateral spines are in the specimens of which we have knowledge from eighteen to twenty-five in number.

We have noted in *Mysidetes Farrani* a variation in the telson at least equal to that which separates the original descriptions of *M. insignis* and *M. hibernica*.

Additional records.

75 mi. W.S.W. of Fastnet, Co. Cork, 190 fath., May, 1904, townet on trawl.—Two, 15 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—Two, 9 and 11 mm.

Same locality, 360 fath., May, 1905, townet on trawl.—Two, 10 and 13 mm.

Porcupine Bank, Lat. $53^{\circ} 39' N.$, Long. $12^{\circ} 24' W.$, 185 fath., May, 1905, townet on trawl.—One, 15 mm.

Porcupine Bank, Lat. $53^{\circ} 2' N.$, Long. $13^{\circ} 48' W.$, 105 fath., May, 1905, townet on trawl.—Eleven, 10 mm.

GENUS *Leptomysis*, G. O. Sars.*Leptomysis gracilis*, G. O. Sars.

Porcupine Bank, Lat. $53^{\circ} 2' N.$, Long. $13^{\circ} 48' W.$, 105 fath., May, 1905, townet on trawl.—Three, 12 mm.

While this species occurs in our gatherings from shallow water off the south and west coasts and is very common in the Irish Sea, we have only once found it (as above) in deep-water collections. Its occurrence elsewhere in water of more than 40 or 50 fath. does not appear to have been reported, but it has been taken in as little as 10 fath., and is in fact a littoral species. On this account its presence on or near the Porcupine Bank is of obvious interest.

SUB.-FAM. nov. *MYSIDETINAE*.

Differing from *Leptomysinae* in having the pleopods rudimentary in both sexes.

Type-genus *Mysidetes*, nov.

We suppose that the institution of sub-families in the *Mysidae* is regarded rather as an aid to determination of specimens than as an expression of equally important taxonomic distinctions. The *Mysidetineae*, differing from the *Leptomysinae* only in the characters of the pleopods, closely resemble in the characters of the antennal scale and telson the *Heteromysinae* and *Mysidellinae*, which also have the pleopods rudimentary in both sexes; but are distinguished from them, respectively, by the structure of the third and first thoracic limbs.

GENUS *Mysidetes*, nov.

Antennal scale lanceolate, setose all round.

Mandibles with a distinct and well developed molar process and a three-jointed palp.

First maxillae with the inner lobe better developed than in the genus *Mysidopsis* and bearing more setae.

Second maxillae with the exognath well developed, inner setiferous expansion of the basal part present and well developed.

First thoracic legs six-jointed, fairly stoutly built and well armed with plumose setae.

Second thoracic legs much as in the genus *Mysidopsis*, feebly armed.

Remaining legs with a three-jointed tarsus.

Pleopods of both sexes rudimentary and much as in females of the genus *Mysidopsis*.

Telson elongate, cleft; cleft armed with small teeth; sides of telson armed with spines: no median setae.

Inner uropods with a row of spines along the greater part of the inner edge, otocyst not exceptionally large.

Type, Mysidetes Farrani (H. and T.).

Mysidetes Farrani (H. & T.).

Pl. V.

Mysideis (?) *Farrani*, Holt and Tattersall, 1905 (1).

Form moderately robust. *Carapace* much wider than pleon, slightly emarginate posteriorly; produced in front into an obtusely rounded rostrum. *Pleon* longer than carapace, its first four segments subequal in length, the fifth slightly longer than the fourth, the last segment one and a quarter times as long as the fifth. *Eyes* large, nearly globose, extending to the distal joint of the antennular peduncle, pigment golden brown. *Antennular peduncle* strongly built, the middle (second) joint very small, the distal joint stouter than the other two and equal in length to the basal joint. *Antennal peduncle* with the antepenultimate joint small, the penultimate joint longer than the last, each of the latter joints with a few setae on their inner distal corners. *Antennal scale* lanceolate, about four times as long as broad, setose all round, extending for a little way beyond the antennular peduncle, and about half as long again as the antennal peduncle. *Mouth parts* as for the genus. *First thoracic legs* six-jointed, moderately stoutly built, with the merus longer than the carpus, the carpus longer than the propodus, nail distinct; the inner edge of the last four joints armed with plumose setae. *Second thoracic legs* very much as in the genus *Mysidopsis*, with the merus nearly as long as the carpus and propodus combined, the latter shorter than the carpus, and densely setose; nail distinct; the whole appendage except the propodus feebly armed. *Third thoracic legs* with the tarsus three-jointed, and shorter than the merus; nail distinct and as long as the last two joints of the tarsus combined. *The remaining thoracic legs* with the first joint of the tarsus proportionally longer than in the third pair, in other respects agreeing with the latter. *Exopods* of the thoracic limbs well developed, with the outer distal corner of the basal joint bluntly rounded, the flagelliform part of nine joints except in the first pair of limbs, where it is eight-jointed. *Pleopods* of both sexes rudimentary, as in females of the *Leptomysinae*. *Telson* as long as the last segment of the pleon, gradually narrowing towards the apex, where it is rather

less than half the width at the base; apex truncate and cleft, the cleft varying in depth from one-fifth to one-tenth of the total length of the telson; cleft armed with three small spines at the apex and about three to five on each side; apex with a pair of spines on each side of the cleft, the inner pair being the shortest; lateral margins armed with from ten to twenty-two spines, which commence at about the level of the otocyst and continue to the apex, gradually increasing in size. *Inner uropods* about half as long again as the telson, rather narrow, with from twenty-five to twenty-eight spines in a row along the inner edge, the spines commencing about opposite the centre of the otocyst and extending from about two-thirds to three-quarters of the way to the extremity. *Outer uropods* about twice as long as the telson, and one and a half times as long as the inner. *Length* of the largest specimen, 28 mm. Males mature at about 15 mm.

In our preliminary notice of the species, having then only three damaged female specimens for examination, we doubtfully referred it to the genus *Mysideis*. Other nine* came to hand in time for inclusion in the list of localities (1905 (1), p. 146), but too late for close study. We now find that our material—twenty-one specimens in all, includes both sexes. Males and females alike have rudimentary pleopods, though the larger males are evidently mature.† While this circumstance removes *Mysidetes* from the *Leptomysinae* it affords no assistance in distinguishing the females of *Mysidetes* from those of *Mysideis* and *Mysidopsis*. We have, therefore, prepared a table in which the distinctive characters are set forth in parallel columns.

* Six more were found afterwards in the gathering made at 454 fath., November, 1904.

† We take it that a male with well-developed antennular brush is mature. In *Mysideis insignis* the range in size from the smallest mature male to the largest example appears to be about the same as in the species before us, which is, therefore, not singular in that respect.

—	<i>Mysidopsis.</i>	<i>Mysidetes.</i>	<i>Mysideis.</i>
Mandible, ..	Without molar process.	With molar process.	With molar process.
First maxilla,	Inner lobe rather small and armed with few setae.	Inner lobe normal in size, armed with several setae.	Inner lobe normal in size, armed with several setae.
Second maxilla,	Without inner setiferous expansion of the basal part.	With inner setiferous expansion of the basal part.	With inner setiferous expansion of the basal part.
First thoracic legs.	Six-jointed, of normal stoutness and armature.	Seven-jointed, of normal stoutness and armature.	Seven-jointed, very massive, and very strongly armed.
Second thoracic legs.	Normal, ..	Normal, ..	Unusually massive and very densely and strongly armed.
Telson, ..	With or without a cleft; cleft when present unarmed; no median setae.	With a cleft; cleft armed; no median setae.	With a very shallow cleft; cleft unarmed; median setae present.
Inner uropods	With few spines confined to the region of the otocyst.	With many spines extending well over half way down the uropod.	With few spines confined to the region of the otocyst.
Pleopods of the male.	Well developed, hiramous.	Rudimentary. ..	Well developed, hiramous.

Mysidopsis incisa, G. O. Sars, described in the *Challenger* report, ought most probably to be referred to *Mysidetes*. We have examined the type in the British Museum and find that in addition to the armed cleft of the telson it has a row of spines on the inner uropod exactly as in *M. Farrani*. It is a female.

Our material of *M. Farrani*, though not very numerous, exhibits considerable variation in the telson and uropods. The variation in the depth of the cleft of the telson is rather surprising. It may be as little as one-tenth and as great as one-fifth of the total length of the telson. The armature of the cleft is not always the same, nor is it invariably symmetrical. The specimen which we have used for illustration has three small spines at the apex and four and five on the sides. Another specimen has three at the apex and four on each side, while yet a third has three at the apex, four on one side

and three on the other. The number of spines on the inner uropod varies from twenty-five to twenty-eight, and is not always the same on the two inner uropods of the same animal. We have counted twenty-five on one side and twenty-six on the other, and in another instance twenty-six on one side and twenty-eight on the other. The distance to which the spines on the inner uropod extend is likewise variable. We have found them extending as little as two-thirds of the way down in one specimen, and as much as three-quarters of the way down in others. The spines of the lateral margins of the telson vary according to age, as seems to be at least not unusual in *Mysidae*, from twelve to twenty-two.

We subjoin a table in which is given the results of a critical examination of all our material. It may be mentioned that specimens 8, 13 and 18 were the three first specimens to hand, and were those from which our preliminary description was drawn up.

TABLE showing variations in the armature of the telson.

Length of Specimen in Millimetres.	Proportion of Length of Cleft to Length of Telson.	Spines arming Margins of Telson.		Spines Arming Cleft of Telson.	Index Number of Specimen.
		Left Side.	Right Side.		
16	1 : 10	12	11	9	1
15	1 : 8	13	12	8	2
15	1 : 8	12	12	6	3
14	1 : 8	13	13	6	4
13	1 : 8	10	10	9	5
13	1 : 10	12	12	8	6
13	1 : 9	11	11	9	7
12	1 : 5	21	21	13	8
12	1 : 8	12	11	8	9
11	1 : 8	12	12	8	10
11	1 : 8	11	11	8	11
10	1 : 6	10	10	10	12
10	1 : 5	21	20	13	13
9	1 : 6	10	10	9	14
9	1 : 10	10	10	6	15
9	1 : 6	13	13	9	16
9	1 : 6	11	12	8	17
7	1 : 5	?	16	10+	18*
28	1 : 7	26	25	12	19
28	1 : 6	23	22	13	20
12	1 : 10	11	10	7	21

Additional record.

50 mi. W.N.W. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—Two, 28 mm.; one, 12 mm.

* Telson broken.

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The known vertical range is from 337 to 454 fath., while the known horizontal range remains confined to a small area off the coast of County Kerry.

SUB-FAM. *MYSINAE*.

GENUS *Dasymysis*, Holt and Beaumont.

Dasymysis longicornis (M.-Ed.).

Mysis longicornis, Milne-Edwards, 1837.

Mysis longicornis, G. O. Sars, 1877.

Acanthomysis platydens, Czerniavsky, 1882.

Acanthomysis longicornis, Czerniavsky, 1882.

Acanthomysis spinosissima, Czerniavsky, 1882.

Acanthomysis longicornis, Norman, 1905.

70 mi. S.W. of Fastnet, Co. Kerry, 81 fath., May, 1905, townet on trawl.—One, 10 mm.

D. longicornis is known to us from less than 50 fath. at several localities on the west coast, and is very common in the Irish Sea.

SUB-FAM. *ARACHINOMYSINAE*, H. and T.

GENUS *Chunomysis*, H. & T

Chunomysis diadema, H & T.

Additional record.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—One, 5 mm.

SUB-FAM. *SIRIELLINAE*, Czerniavsky.

GENUS *Siriella*, Dana.

Siriella norvegica, G. O. Sars.

10 mi. W.N.W. of Tearaght, Co. Kerry, 76 fath., November, 1904, townet at surface.—One, 16 mm., ovigerous.

This *Siriella* seems to be more truly pelagic than its British-and-Irish congeners, and, as far as our collections go to show, is one of the rarest Mysids on the west coast. It may, however, prove less rare when the very large townets have been more worked over the inshore grounds to which we think it belongs rather than to the ocean.

SUB.-FAM. *GASTROSACCINAE*, Norman.

GENUS *Haplostylus*, Kossmann.

Haplostylus Normani (G. O. Sars).

Additional records.

Porcupine Bank, Lat. $53^{\circ} 38' N.$, Long. $13^{\circ} 19' W.$, 135 fath., August, 1904, townet on trawl.—Six, 6 to 8 mm., and ten very small.

80 mi. W.N.W. of Slyne Head, Co. Galway, 180 fath., August, 1904, townet on trawl.—One, 7 mm.

Porcupine Bank, Lat. $53^{\circ} 2' N.$, Long. $13^{\circ} 48' W.$, 105 fath., May, 1905, townet on trawl.—Eighteen, 6 to 13 mm.

Porcupine Bank, Lat. $53^{\circ} 20' N.$, Long. $13^{\circ} 0' W.$, 164 fath., May, 1905, townet on trawl.—One, fragmentary.

SUB.-FAM. *BOREOMYSINAE*, H. and T.

GENUS *Boreomysis*, G. O. Sars.

Boreomysis arctica (Kröyer).

Boreomysis arctica, G. O. Sars. 1870-79.

Additional records.

50 mi. W.N.W. of Tearaght, Co. Kerry, 372 fath., February, 1905, townet on trawl.—Nineteen, 15 to 22 mm.

50 mi. W.N.W. of Tearaght, Co. Kerry, 360 fath., May, 1905, townet on trawl.—One, 18 mm.

Lo Bianco (1903) has announced the capture in the Mediterranean of examples which he refers to this species. Some of these, which we have been permitted to examine, differ in no obvious respect from the Irish specimens, which are in agreement with Sars' descriptions of Norwegian forms. This Mysid would therefore seem to have a distribution equivalent to that of the Euphausian *Meganyctiphanes norvegica*, extending from the Arctic region to the Mediterranean. In our previous communication we included Jan Mayen in the list of localities. This, as Dr. Hansen has suggested to us, is an error of transcription from Sars' table (1870-79).

Boreomysis tridens, G. O. Sars.

Additional record.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $14^{\circ} 50' W.$, 500 fath., May, 1905, townet on trawl.—Ten, 9 to 24 mm.

Boreomysis megalops, G. O. Sars.*Additional records.*

50 mi. W.N.W. of Cleggan Head, Co. Galway, 120 fath., May, 1904, townet on trawl.—Two.

54 mi. W.N.W. of Eagle Island, Co. Mayo, 200 fath., August, 1904, townet at bottom.—One, 10 mm.

Porcupine Bank, Lat. $53^{\circ} 39' N.$, Long. $12^{\circ} 24' W.$, 185 fath., May, 1905, townet on trawl.—Two, 14 and 16 mm.

Porcupine Bank, Lat. $53^{\circ} 2' N.$, Long. $13^{\circ} 48' W.$, 105 fath., May, 1905, townet on trawl.—Two, 10 mm.

Porcupine Bank, Lat. $53^{\circ} 30' N.$, Long. $13^{\circ} 0' W.$, 164 fath., May, 1905, townet on trawl.—One, 10 mm.

Boreomysis microps, G. O. Sars.

Boreomysis subpellucida, Hansen, 1905 (1).

We recorded (1905) a specimen which we considered referable to *B. microps*, but were induced, by the publication of Hansen's description of *B. subpellucida*, to examine Sars' type, which is in the British Museum. The fact is that in so far as the diagnosis of *B. microps* differs from that of *B. subpellucida*, the former is erroneous. The type (and Sars' only) specimen of *B. microps* is in rather bad condition, and especially the eyes are badly preserved, but on one of them the papilla of *B. subpellucida* is easy to distinguish, and in all other respects the two forms agree. Hansen's figures of the antennal scale and telson appear to us to be more faithful to the type than the drawings given in the *Challenger* report, but the difference is at most slight.

We find that in small examples (about 7 mm.) the dilatation at the top of the apical cleft of the telson is not yet developed, but is represented only by an extremely narrow fissure. Otherwise the young present no obvious difference from the adult. The spinules between the lateral spines of the telson, figured by Sars and mentioned by Hansen, are already present.

Additional records.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., February, 1905, townet at 700 fath.—One, 7 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $14^{\circ} 50' W.$, 500 fath., May, 1905, townet on trawl.—One, 7 mm.

W. of Porcupine Bank, Lat. $53^{\circ} 7' N.$, Long. $15^{\circ} 6' W.$, 860 fath., May, 1905, Petersen trawl at 700 fath.—Twenty-two, 6 to 18 mm.

50 mi. N. by W. of Eagle Island, Co. Mayo, 1,200 fath., May, 1905, Petersen trawl at 1,150 fath.—Ten, 17 to 20 mm.

Petersen's net has demonstrated that this oceanic species is abundant on the confines of our area, and Dr. Hansen tells us that it is common towards Iceland and the Färöe Islands. He has recorded it from near the Azores and Canary Islands. As the original record is from off Nova Scotia *B. microps* would seem to be generally distributed throughout the North Atlantic.

SUB-FAM. *MYSIDELLINAE*, Czerniavsky.

GENUS *Mysidella*, G. O. Sars.

Mysidella typica, G. O. Sars.

Additional records.

50 mi. W.N.W. of Slyne Head, Co. Galway, 112 fath., August, 1904, townet on dredge.—One, 7 mm.

W. of Porcupine Bank, Lat. 53° 1' N., Long. 14° 34' W., 293 fath., May, 1905, townet on trawl.—Three, 6 to 8 mm.

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NOTE ADDED IN PRESS.*

Nyctiphanes Couchi.

In our previous report (1905 (1) p. 103), we stated that *Nyctiphanes Couchi* could be distinguished from *N. australis* by the presence in the former of a spine over the base of the telson. For this we relied upon the accuracy of Sars' (1885) descriptions and figures. Stebbing (1905), in recording *N. australis* from the Cape of Good Hope, remarked the presence of a spine in that species. Examination of the *Challenger* material, including the types, has shown that the spine is always present in *N. australis*, and about as large as in *N. Couchi*, and the only differences which we can detect are:—

Females of about 8 mm. and upwards, and young males of *N. Couchi* have a digitate leaflet on the second joint of the antennular peduncle. Neither sex of *N. australis* has such a leaflet, though large females may have a minute simple process in the same place. Adult males of *N. Couchi* have, on the proximal intero-ventral corner of the third joint of the antennular peduncle, a group of three to five closely-set plumose setiform spines which are not present in adult males of *N. australis*.

EXPLANATION OF THE PLATES.

PLATE I.

Thysanopoda acutifrons.

- Fig. 1. Lateral view of young specimen, 16 mm.
 „ 2. Dorsal view of head of adult female, 37 mm.

PLATE II.

Thysanopoda distinguenda,

Female, 23 mm.

- Fig. 1. Lateral view.
 „ 2. Dorsal view of head.
 „ 3. Dorsal view of telson and uropods.

PLATE III.

Pseudomma affine.

- Fig. 1. Dorsal view of female, 10 mm.
 „ 2. Left eye-plate of male.
 „ 3. Left eye-plate of female.
 „ 4. Antennal scale.
 „ 5. Telson, of a male, with the usual number of apical spines.
 „ 6. Telson, of a female, with five pairs of apical spines.

* See page 12.

Pseudomma nanum,

Male, 7 mm.

- Fig. 7. Dorsal view.
 " 8. Left eye-plate.
 " 9. Antenna and antennule.
 " 10. Telson.

PLATE IV.

Pseudomma calloplura,

Male, 11 mm.

- Fig. 1. Dorsal view.
 " 2. Antenna.
 " 3. Endopod of 1st thoracic limb.
 " 4. Endopod of 2nd thoracic limb.
 " 5. Pleopod of 1st pair.

Pseudomma Kempf,

Female, 12 mm.

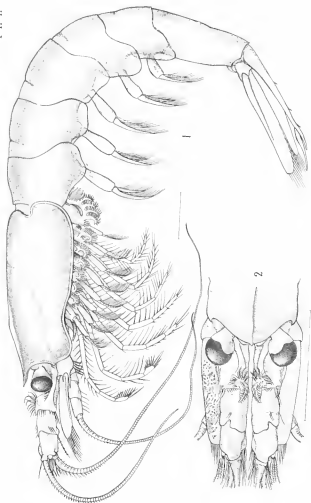
- Fig. 6. Dorsal view.
 " 7. Antenna.
 " 8. Antennule.
 " 9. Endopod of 1st thoracic limb.
 " 10. Endopod of 2nd thoracic limb.

PLATE V.

Mysidetes Farrani,

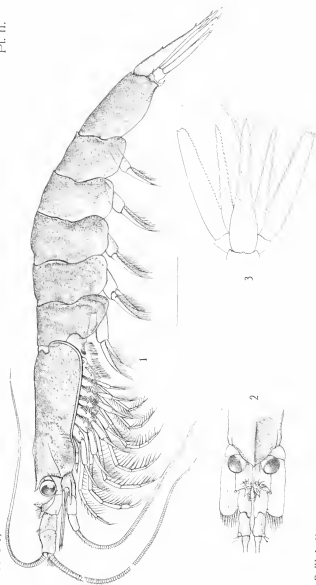
Female, 14 mm.

- Fig. 1. Dorsal view.
 " 2. Antenna.
 " 3. Endopod of 1st thoracic limb.
 " 4. Endopod of 2nd thoracic limb.
 " 5. Endopod of 3rd thoracic limb.
 " 6. Telson.



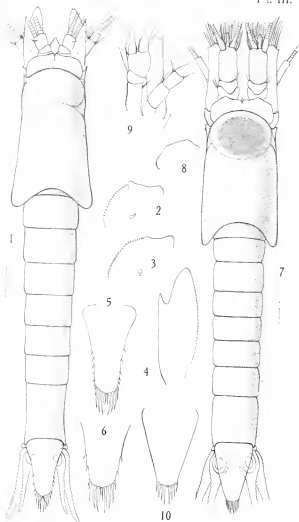
E. W. L. H. } del
G. M. W. }

Thysanopoda acutifrons.



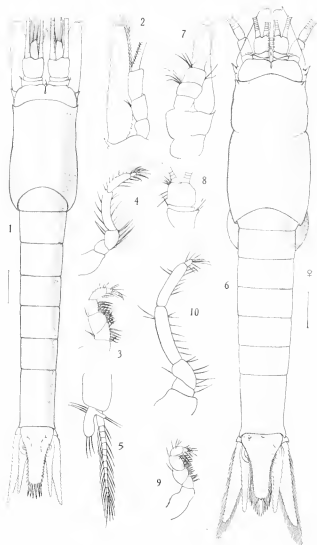
E. W. L. H.)
 W. M. T. } del.
 G. M. W.

Thysanopoda distinguenda.



W. M. T. } del.
G. M. W. }

1-6, *Pseudomma affine*.
7-10, *Pseudomma nanum*.

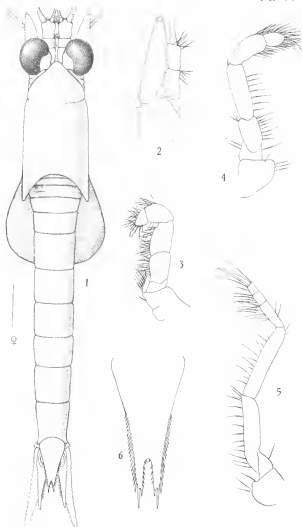


E. W. L. H. }
 W. M. T. } del
 G. M. W. }

1-5, *Pseudomma calloptura*.
 6-10, *Pseudomma Kempfi*.

V. '04.

Pl. V.



W. M. T. }
G. M. W. } del.

Mysidetes Farrani.

d

APPENDIX, No. VI.

- i. Plankton collected at Irish Light Stations in 1904, by LEWIS HENRY GOUGH, Ph.D.
 - ii. Hydrographical Observations at Irish Light Stations, 1904.
-

i.

PLANKTON COLLECTED AT IRISH LIGHT STATIONS IN 1904.

BY

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INTRODUCTION.

The results of townetings taken regularly every fortnight in 1904 at Skulmartin, South Arklow and Coningbeg Lightships, and at Fastnet Lighthouse, are shown on the following tables.

All the samples were taken in the same way, and with similar apparatus. The nets used each have an opening of 18 inches diameter, the bags are 36 inches long, conical and truncated at the ends; the diameter of the cod-end is $2\frac{1}{2}$ inches. The nets themselves are made of two grades of silk, the front 18 inches are of silk with 50 meshes to the inch, the hinder 18 being of silk with 180 meshes to the inch. This arrangement enables the net to catch the zooplankton and phytoplankton equally well. The samples were taken from the Light stations, using the movement of the tide to capture the plankton. Each sample represents half an hour's tide-flow through the nets. To ensure greater comparability the samples were always taken at spring-tides, at the same state of the tides, so that, for each station, the samples are taken from water coming from the same direction.

It is perhaps too early, before another year's results have been obtained, to discuss in detail the changes, seasonal or otherwise, in the plankton at the different stations; a comparison of the stations *inter se*, however, produces interesting results.

According to the general character of the plankton, the stations under consideration can easily be arranged into two groups—

Fisheries, Ireland, Sci. Invest., 1904, VI., [Published, April, 1906].

q 2

Fastnet and Coningbeg on the one side, Skulmartin and South Arklow on the other. The material taken at Fastnet and Coningbeg was very similar, almost always consisting nearly entirely of zooplankton, *Calanus finmarchicus* and *Metridia lucens* forming the bulk of the samples; the phytoplankton from these stations was always poor in species and in quantity. A noticeable fact is the generally discontinuous range of the species during the year. In contrast to this, the plankton taken at South Arklow and Skulmartin usually showed a smaller quantity of zooplankton, the bulk of the samples always being less than that from Coningbeg or Fastnet. At the same time, the phytoplankton was usually richer, especially in individuals, the range of several of the species being much more continuous.

It is often a noticeable fact that when the plankton is specially rich in copepods, the phytoplankton is correspondingly poor. Samples containing very large quantities of zooplankton seem further to be most often met with in positions similar to those of Coningbeg or Fastnet; as for instance, in the most western portions of the English Channel, on the border between the open ocean and the enclosed or coastal waters. In the case of the discontinuous range in time of some of the species of phytoplankton, the position again seems to be an important factor. This is especially the case with neritic diatoms, such as *Biddulphia mobiliensis*. In some places it appears to be a seasonal species, whose period of vegetation falls in the winter and early spring, for instance, at Coningbeg and Fastnet; in other localities it is found for a much longer period, and in places where the factors which go to make the plankton assume a neritic character are most evident, it becomes a perennial, as at South Arklow and Skulmartin. This is also the case to a greater or lesser degree with several other neritic organisms, such as species of *Guinardia*, *Hyalodiscus*, *Coscinodiscus*, and *Bacillaria*. In a similar way among the Copepoda neritic species which appear to be seasonal at some places, are perennial at others, for instance, *Temora longicornis*; but in this case there is a great difference. *Temora* is usually commoner during the warmer part of the year, disappearing in winter more or less at stations nearer the ocean, but being fairly constant at sheltered places far from its influence. This is specially noticeable in the English Channel, where it spreads far to the west in summer, but is restricted to the east in winter.

As will be seen from the tables, *Muggiaea atlantica* was observed first at South Arklow, then at Coningbeg, and then at Fastnet. In this connection it is interesting to observe that the shoals of *Muggiaea* probably struck the Irish Coast after having travelled through the English Channel, which they entered at Ushant in May. As I have dealt with the migrations of *Muggiaea* in *extenso* in another paper on the subject (*Publications de Circonstance*, No. 29, *Conseil Permanent International pour l'Exploration de la Mer*), further reference is unnecessary here.

The *Pasiphaë* referred to in the Tables for South Arklow and Skulmartin was probably *P. sivado*, Risso.* It appears to occur there at times in great quantities, as many as 7 or 8 full-grown specimens having been taken in single tow-nettings (in 1905).

Since these tables were printed, Professor H. H. Gran's paper "Diatomaceen" has appeared in "Nordisches Plankton." According to this paper, the *Thalassiothrix curvata* and *T. Frauenfeldi* mentioned in the following tables should be *Thalassiothrix nitzschoides*, Grun.

For the rest, I leave the Tables to speak for themselves. The signs used there are the same as are recommended by the Central Bureau of the Conseil Permanent International pour l'Exploration de la Mer: they are—

rr. very rare.

r. rare.

+ moderately numerous.

c. common.

cc. very common.

* *P. sivado* is hardly represented in published records from the seas between England and Ireland. Adults are, however, common in Lambay Deep, and the young have often been taken by the *Helga* in other parts of the Irish Sea — E. W. L. H.

PLANKTON COLLECTED AT

SKULMARTIN LIGHTSHIP.

Species No.		Jan.	Feb.			March.			April.		May.		June.	
		22.	3.	10.	3.	10.	17.	24.	15.	20.	16.	20.	15.	20.
		10.30 a.m.	8.30 a.m.	5.0 a.m.	5.30 a.m.	8.30 a.m.	7.30 a.m.	6.30 a.m.	7.40 a.m.	8.0 a.m.	8.30 a.m.	8.15 a.m.	8.15 p.m.	8.15 p.m.
	DIATOMACEÆ.	1	2	3	4	5	6	7	8	9	10	11	12	
1	<i>Achnanthes</i> sp., .. ..	..	..	6	7	..	..	7	17	17	..	17		
2	<i>Actinopteryx undulatus</i> , Ehbg.	7	+	+	+	+	+	7	7	7	7	7	7	7
3	<i>Astenoella glacialis</i> , Castr.	..	..	17	17	..	..	..	..	..	+	..	+
4	<i>Bacillaria paradoxa</i> (Gmel.), Gran.	7	+	+	+	6	+	7	+	7	+	7	7	7
5	<i>Belerochea malleus</i> , (Bew.), V. Heurck.	..	..	..	..	..	17	..	..	..	..	..	..	..
6	<i>Eudisiphia alternans</i> (Baill.), V. Heurck.	..	..	..	..	..	17	..	..	..	..	..	..	..
7	— <i>aurita</i> , (Lyng.) Breb., ..	..	..	17	..	..	17	17	7	..	..	..	..	..
8	— <i>favus</i> , (Ehbg.), V. Heurck.	..	..	..	17	..	17	..	..	7	..	..	..	..
9	— <i>mobiliensis</i> , Baill., ..	+	c	c	c	+	+	7	c	+	c	..	7	
10	<i>Ceratium Bergonii</i> , Pérag.	..	..	..	..	..	..	..	..	..	+	6	c	
11	<i>Chaetoceros constrictum</i> , Gran.	..	..	17	..	7	7	7	..	..	..	17	7	coll spms
12	— <i>contortum</i> , Schütt., ..	..	..	..	..	..	7	..	..	7	7	..	..	..
13	— <i>convolutum</i> , Castr., ..	..	..	..	..	..	..	..	..	..	7	..	..	..
14	— <i>crinitum</i> , Schütt., ..	..	..	..	..	..	..	..	..	..	..	..	..	c
15	— <i>curvatum</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	c	..	..	..
16	— <i>danicum</i> , Cleve, ..	..	..	17	..	+	+	7	..	..	..	..	..	..
17	— <i>debile</i> , Cleve, ..	..	..	..	..	7	7	7	..	7	7	7	7	7
18	— <i>decipiens</i> , Cleve, ..	+	..	7	..	..	7	7	..	+	7	7	7	7
19	— <i>diadema</i> (Ehbg.), Gran.	..	17	+	..	..	..	..	..	7	+	..	..	..
20	— <i>didymum</i> (Ehbg.), Cleve.	..	..	..	..	..	..	..	..	..	..	..	..	..
21	— <i>laciniosum</i> , Schütt., ..	..	..	..	..	..	..	..	..	..	7	..	7	..
22	— Schütt., Cleve, ..	17	..	..	..	..	..	..	..	..	..	..	..	..
23	— <i>scolopendra</i> , Cleve, ..	..	..	..	..	..	..	..	..	7	+	..	..	..
24	<i>Coscinodiscus oocentrus</i> , W. Sm.	+	..	7	+	+	+	7	7	7	7	..	17	..
25	— <i>excentricus</i> Ehbg., ..	c	c	c	c	c	+	+	c	+	..	..	7	..
26	— <i>Grand</i> , Gough, ..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	— <i>oculus indus</i> , Ehbg., ..	..	..	..	..	..	..	..	..	..	..	17	7	..
28	— <i>radiatus</i> , Ehbg., ..	c	c	..	c	c	+	+	c	+	+	+	+	+
29	<i>Coscinodiscus polychorda</i> , Gran.	..	..	..	..	..	..	..	..	..	..	..	..	..
30	<i>Ditylum Brightwelli</i> , West.	7	7	+	..	7	7	..	..	..	..	..	7	7

IRISH LIGHT STATIONS, 1904.

Lat. 54° 32' N., Long. 5° 25' W. 20 Fathoms.

July.		August.		September.		October.		November.		December.		Species No.
15. 7.30 a.m.	16. 8.45 p.m.	18. 8.10 p.m.	17. 8.25 p.m.	11. 9.0 p.m.	16. 8.45 p.m.	10. 8.10 p.m.	15. 8.0 p.m.	8. 8.15 p.m.	24. 7.40 a.m.	3. 7.55 a.m.	23. 8.15 p.m.	
13	14	15	16	17	18	19	20	21	22	23	24	Diatomaceæ.
..	..	..	..	..	ff	..	..	..	..	..	..
ff	ff	..	..	+	f	+	f	f	f	+	..	<i>Achnanthes</i> sp.
cc	ff	ff	..	..	f	..	+	..	..	..	..	<i>Actinopterychus undulatus</i> , Ehbg.
f	ff	..	ff	f	ff	..	..	..	..	..	..	<i>Asterionella glacialis</i> , Castr.
..	..	..	..	..	..	..	..	ff	..	f	..	<i>Bacillaria paradoxa</i> , (Gmel.), Gran.
..	..	..	..	..	..	..	..	ff	..	f	..	<i>Bellerophon malleus</i> , (Btw.), V. Heurck.
..	..	..	..	..	..	..	..	..	..	..	..	<i>Eudalphia alternans</i> (Bail.), V. Heurck.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>aurea</i> , (Lyng.) Breb.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>favos</i> , (Ehbg.), V. Heurck.
f	f	f	+	f	+	+	+	+	0	0	0	— <i>mobiliensis</i> , Bail.
+	ff	..	..	..	..	..	..	..	f	..	..	<i>Ceratodina Bergoni</i> , Pérac.
f	..	ff	..	..	..	..	..	..	..	..	..	<i>Chaetoceros constrictum</i> , Gran.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>contortum</i> , Schütt.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>convolutum</i> , Castr.
f	..	..	..	..	..	..	..	..	..	..	..	— <i>crinitum</i> , Schütt.
+	..	ff	..	ff	..	ff	..	..	..	..	..	— <i>curvisetum</i> , Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>danicum</i> , Cleve.
f	..	..	..	..	..	..	..	..	..	..	..	— <i>debile</i> , Cleve.
+	..	ff	ff	f	+	+	+	+	+	f	+	— <i>deopressa</i> , Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>diadema</i> (Ehbg.), Gran.
..	..	..	..	..	..	..	..	..	f	..	..	— <i>didymum</i> (Ehbg.), Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>laciniosum</i> , Schütt.
..	..	..	..	f	..	..	..	f	f	..	..	— Schütt, Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— <i>scelopendra</i> , Cleve.
..	..	f	..	..	..	..	..	..	..	..	..	<i>Coscinodiscus concinnus</i> , W. Sm.
..	..	..	f	f	f	f	+	+	+	0	0	— <i>excentricus</i> , Ehbg.
..	..	..	..	..	..	..	ff	f	f	..	..	— <i>Granl</i> , Gough.
..	..	..	..	..	f	+	+	..	..	..	..	— <i>oculus tridus</i> , Ehbg.
+	f	+	+	+	0	0	0	+	+	0	0	— <i>radiatus</i> , Ehbg.
ff	..	..	..	..	..	..	..	..	..	..	..	<i>Coscinodiscus polychorda</i> , Gran.
f	f	+	+	f	0	+	+	f	f	..	f	<i>Datylum Brightwelli</i> , West.

SKULMARTIN LIGHTSHIP—continued.

Species No.	—	Jan.	Feb.			March.			April.		May.		June.	
		22. 10.30 a.m.	3. 8.30 a.m.	16. 8.0 a.m.	3. 8.30 a.m.	18. 8.30 a.m.	31. 7.30 a.m.	15. 6.30 a.m.	30. 7.40 a.m.	16. 8.0 a.m.	30. 8.30 a.m.	15. 8.15 a.m.	28. 3.10 p.m.	
	DIATOMACEAE—cont.	1	2	3	4	5	6	7	8	9	10	11	12	
31	<i>Eucampia zodiacus</i> , Ehhg.,	..	..	..	..	..	..	..	..	..	..	F	..
32	<i>Fragilaria c. l. oceanica</i> , Grun.,	..	..	..	..	..	..	..	..	..	..	F	+
33	<i>Guinardia fasciata</i> , Pérag., ..	IT	IT	..	..	F	IT	..	..	..	F	F	+
34	<i>Hyalodiscus stelfingeri</i> , Baal.,	+	+	C	C	F	F	+	F	F	F	F	F	
35	<i>Isthmia</i> sp.,	F	..	F	F	..	..	+	..	IT	..	+	IT
36	<i>Lauderia borealis</i> , Grun., ..	..	..	..	..	F	F	+	..	..	+	IT	..
37	<i>Leptocylindrus danicus</i> , Cleve,	..	..	..	..	..	..	..	..	..	..	..	..
38	<i>Navicula membranacea</i> , Cleve,	..	..	..	..	..	..	..	..	..	..	..	..
39	<i>Nitzschia serriata</i> , Cleve., ..	..	..	..	..	..	..	..	..	..	..	..	..
40	<i>Paralia sulcata</i> (Ehhg.), Cleve,	C	C	+	+	+	+	+	+	+	F	F	F	
41	<i>Pleurosigma</i> sp.,	+	F	F	+	+	+	F	..	F	..	IT	..	
42	<i>Rhizosolenia alata</i> , Btw., ..	..	..	..	..	..	..	..	..	..	..	..	..
43	— <i>delicatula</i> , Cleve, ..	..	..	..	..	..	..	..	IT	..	..	..	+
44	— <i>semipinna</i> , Hensen, ..	..	..	..	..	..	..	..	..	..	F	IT	..
45	— <i>setigera</i> , Btw., ..	..	..	..	..	IT	IT	IT	IT	F	..	..	F
46	— <i>Shrubsolei</i> , Cleve, ..	IT	..	..	IT	F	IT	F	..	..	+	+	IT
47	— <i>Scolerlethi</i> , Pérag., ..	..	..	..	..	..	..	..	..	..	..	IT	..
48	<i>Skeletonema costatum</i> (Grev.), Cleve,	..	..	IT	..	..	+	+	C	F	F	..	..
49	<i>Stephanopyxis turris</i> , Grev.,	..	..	..	..	..	..	..	..	..	..	..	..
50	<i>Streptotheca tamenis</i> (Shr.), Cleve,	+	F	+	+	+	+	+	..	..	+	..	..
51	<i>Thalassiosira gravida</i> , Cleve,	..	..	..	..	..	..	F	F	..	F	..	..
52	— <i>Nordenfalki</i> , Cleve, ..	..	..	..	..	..	..	..	F	F	C	..	..
53	<i>Thalassiothrix curvata</i> , Grun.,	..	F	+	+	+	+	..	F	..	..	..	..
54	— <i>Frausdelli</i> , Grun., ..	F	F	+	+	+	+	F	+	..	..	..	F
	PERIDINIDAE.													
55	<i>Ceratium furca</i> , Clap. & Lachm.,	C	..	+	+	+	+	..	..	..	..	IT	..
56	— <i>fuscus</i> (Ehhg.), Duf., ..	F	..	F	..	..	F	..	..	..	..	..	F
57	— <i>horridum</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..	..	..
58	— <i>longipes</i> (Ball), Cleve,	F	..	..	..	..	..	..	..	..	..	..	..
59	— <i>tripes</i> (O. F. Mül., Vanbiller,	..	..	..	..	..	..	..	..	..	..	..	..
60	<i>Dimorphus acuminata</i> , Clap. & Lachm.,	..	..	..	..	..	..	..	..	..	..	..	..
61	— <i>retundata</i> , Clap. & Lachm.,	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 54° 32' N., Long. 5° 25' W. 20 Fathoms.

July.		August.		September.		October.		November.		December.		Species No.
13.	28.	12.	27.	12.	26.	10.	25.	8.	24.	8.	23.	
7-30 a.m.	8-45 p.m.	8-10 p.m.	8-25 p.m.	9-0 p.m.	8-45 p.m.	8-20 p.m.	8-0 p.m.	8-15 p.m.	7-40 a.m.	7-55 a.m.	8-15 p.m.	
13	14	15	16	17	18	19	20	21	22	23	24	DIATOMACEAE—cont.
..	..	..	..	..	IT	..	F	..	F	..	..
F	..	..	..	..	..	..	..	..	..	..	..	Eucampia zoodiacus, Ehb.
+	+	0	+	+	+	..	IT	..	IT	F	F	Fragillaria c. f. oceanica, Gran.
+	+	+	+	0	+	0	0	0	+	F	F	Gunnardia flaccida, Pér.
F	..	+	+	+	F	+	F	F	+	+	F	Hyalodiscus stelliger, Bail.
..	..	F	F	+	F	+	F	..	IT	..	..	Isthmia sp.
..	..	..	IT	..	..	..	..	..	..	..	..	Laurencia borahia, Gran.
..	..	..	..	..	F	..	..	..	..	..	..	Leptocylindrus danicus, Cleve.
..	..	..	..	..	F	..	..	..	..	..	..	Navicula membranacea, Cleve.
..	..	F	..	..	F	..	..	..	..	..	..	Nitzschia seriata, Cleve.
..	F	+	+	+	+	+	F	+	+	F	+	Paralia sulcata (Ehb.), Cleve.
..	..	IT	+	F	IT	F	F	F	F	F	F	Pleurosigma sp.
IT	..	..	..	..	..	..	..	..	..	..	..	Rhinosolenia alata, Btw.
0	+	+	IT	..	..	..	..	..	..	..	..	— delicatula, Cleve.
IT	..	..	..	..	..	..	..	..	..	..	..	— semispina, Hensen.
+	F	IT	F	F	F	+	F	F	..	..	F	— setigera, Btw.
F	IT	F	..	..	..	..	..	IT	..	IT	..	— Shrubsolei, Cleve.
..	F	0	..	..	F	F	F	..	..	..	..	— Stollterfothi, Pér.
F	IT	IT	IT	..	..	..	..	..	..	..	..	Skeletonema costatum (Grev.), Cleve.
..	..	..	..	..	IT	..	..	..	..	..	..	Stephanopyxis turris, Grev.
..	..	..	IT	..	+	+	0	+	+	+	+	Streptotheca tamesis, (Shr.), Cleve.
IT	..	IT	IT	IT	..	..	..	..	..	..	..	Thalassosira gravida, Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— Nordenskiöldi, Cleve.
..	..	..	..	..	..	..	..	F	..	..	..	Thalassosira curvata, Castr.
F	..	IT	F	F	F	..	F	F	..	F	..	— Fraunfeldi, Grun.
PERIDINIDAE.												
..	F	F	+	+	+	+	+	F	F	..	+	
..	..	..	..	F	F	..	F	..	F	F	F	Ceratium furca, Clap & Lachm.
..	..	..	..	..	..	..	IT	..	..	..	..	— fusca, (Ehb.), Duj.
..	IT	F	..	F	F	+	+	+	0	0	0	— horridum, Cleve.
IT	..	..	..	..	..	..	..	..	..	..	..	— longipes (Bail.), Cleve.
..	..	..	..	..	..	..	..	..	..	..	..	— tripos (O. F. Moll.), Vanb.
..	..	IT	..	..	..	..	..	..	..	..	..	Dinophysis acuminata, Clap. & Lachm.
..	IT	..	..	..	..	..	..	..	..	..	..	— rotundata, Clap. & Lachm.

SKULMARTIN LIGHTSHIP—continued.

Species No.	—	Jan.	Feb.			March.			April.		May.		June.	
		22. 10.30 a.m.	3. 8.30 a.m.	16. 8.0 a.m.	3. 8.30 a.m.	18. 8.30 a.m.	31. 7.30 a.m.	15. 6.30 a.m.	30. 7.40 a.m.	16. 8.0 a.m.	30. 8.30 a.m.	15. 8.15 a.m.	11. 3.15 p.m.	
	PRADINIDAE—cont.	1	2	3	4	5	6	7	8	9	10	11	12	
62	<i>Diplopoda lenticula</i> , Bergh.	..	..	..	..	..	..	..	..	..	..	..	..
63	<i>Peridinium conicum</i> , Gran.	..	..	..	..	..	..	..	..	..	..	..	..
64	— <i>depressum</i> , Bail.	..	..	..	..	..	..	..	..	..	..	..	..
65	— <i>globulum</i> , Stein.	..	..	..	..	..	..	IT?	..	..	..	..	..
66	— <i>ovatum</i> , (Fosch.) Schult.	F	F	F	IT	..	..	..	..	..	F	..	F
67	— <i>palidum</i> , Ostent.	F	F	..	+	..	..	..	..	..	..	IT	F
68	— <i>pentagonum</i> , Gran.	..	..	..	..	..	..	..	..	..	..	IT	..
69	<i>Prorocentrum micans</i> , Ehb.	..	..	IT	..	..	IT	..	..	..	..	..	..
	FLAGELLATAE.													
70	<i>Dinobion pellucidum</i> , Lev.	..	IT	F	+	?	IT	..	F	..	..	..	..
	PASTROCOCOIDAE.													
71	<i>Halosphaera viridis</i> , Schmitz.	..	..	..	F	..	..	..	F	..	..	..	..
72	<i>Hexastenella problematica</i> , Cleve.	..	..	with 7 processes. F	..	..	with 7 processes. F	..	..	..	with 7 processes. F	..	..
73	<i>Trochiscia Clevei</i> , Lemm.	..	..	..	F	..	F	F	..	..	..	IT	..
74	— <i>paucispinosa</i> (Cleve), Lemm.	..	..	F	..	..	..	..	..	..	..	..	..
	SILICOFLAGELLATAE.													
75	<i>Dictyocha fibula</i> , Ehb.	..	..	IT	IT	..	..	F	..	..	..	..	..
76	<i>Diastephanus speculum</i> (Ehb.) Haeckel.	..	..	..	..	..	..	..	..	..	..	..	..
	INCERTAE SEDIS.													
77	"Umriade Cyste," Hansen.	F	..	F	..	..	..	F	..	..	..	..	..
78	"Burbierbeckmatatoblast," Hansen.	..	..	F	F	F	+	C	F	..	..	F	F
	PROTOZOA.													
79	<i>Cyrtarocylla serrata</i> , (Meb.) Brandt.	..	..	..	..	..	..	..	..	..	..	..	..
80	<i>Tintinnopsis borealis</i> , Stein.	..	IT	IT	IT	IT	IT	..	..	..	F	IT	..
81	— <i>campanula</i> (Ehb.), De- day.	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 54° 32' N., Long. 5° 25' W. 20 Fathoms.

July.		August.		September.		October.		November.		December.		Species No.
13 7-30 a.m.	15 8.45 p.m.	12 8.10 p.m.	17 8.25 p.m.	12 9.0 p.m.	16 8.45 p.m.	10 8.10 p.m.	15 8.0 p.m.	8 8.15 p.m.	14 7.40 a.m.	8 7.55 a.m.	13 8.15 p.m.	
13	14	15	16	17	18	19	20	21	22	23	24	PERIDINIDAE—cont.: <i>Euplesiopsis lenticula</i> , Bergh. 62 <i>Perdinium conicum</i> , Gran. 63 ——— <i>depressum</i> , Bail. 64 ——— <i>globulus</i> , Stein. 65 ——— <i>ovatum</i> (Fouch.), Schütt. 66 ——— <i>pallidum</i> , Ostrel. 67 ——— <i>pentagonum</i> , Gran. 68 <i>Prorocentrum micans</i> , Ehb. 69
IT	F	F	F	..	IT	F	F	F	+	F	F	
..	..	..	..	..	IT	..	..	..	..	IT	..	
..	..	..	..	..	..	..	..	IT	..	IT	..	
..	..	..	..	..	..	..	..	..	..	IT	..	
IT	IT	IT	..	..	..	..	..	..	..	F	F	
+	F	F	..	..	IT	IT	+	F	F	..	..
IT	..	..	..	F	IT	..	IT	..	..	..	..
..	+	
												FLAGELLATAE. <i>Dinobrium pelucidum</i> , Lev. 70
..	
												PROTOCOCCONIDAE. <i>Halosphaera viridis</i> , Schmitz. 71
..	
..	..	..	..	..	..	..	..	..	..	..	..	<i>Heizmateria problematica</i> , Cleve. 72
..	
..	..	..	..	..	..	..	..	..	..	..	..	<i>Trochiscia</i> Cleve, Lemm. 73 ——— <i>parvispinosa</i> , (Cleve), Lemm. 74
..	
..	..	..	..	..	..	..	..	..	..	..	..	SILICOFAGELLATAE. <i>Dictyocha fibula</i> , Ehb. 75 <i>Dactylopus speculum</i> , (Ehb.) Haeckel. 76
..	
..	..	..	..	..	..	..	..	..	..	..	..	INCERTAE SEDIS. "Uniridete Cyste," Hensen. 77 "Bachierbeckenstatoblast," Hensen. 78
..	
..	..	..	..	..	..	..	..	..	..	..	..	PROTOKA. <i>Cyrtarocylis serrata</i> , (Möh.) Brandl. 79 <i>Tintinnopsis beroidea</i> , Stein. 80 ——— <i>campanula</i> (Ehb.), Da- day. 81
..	IT	..	..	IT	..	..	IT	..	..	..	..
..	..	IT	..	IT	IT	..	F	..	+	..	..
..	..	IT	..	..	IT	..	..	..	..	..	..

SKULMARTIN LIGHTSHIP—continued.

Species No.	—	Jan.	Feb.			March.			April.		May.		June.	
		22.	3.	16.	3.	18.	31.	15.	30.	16.	30.	15.	18.	
		10.30 a.m.	8.20 a.m.	8.0 a.m.	8.30 a.m.	8.30 a.m.	7.30 a.m.	6.30 a.m.	7.40 a.m.	8.0 a.m.	8.30 a.m.	8.15 a.m.	3.15 p.m.	
COELENTERATA.														
82	<i>Corymorpha nutans</i> , Sars, ..	..	..	..	..	..	..	..	..	..	..	..	..
83	<i>Diporeia balterata</i> , Forbes, ..	..	..	..	..	..	..	..	..	..	..	..	..
84	<i>Hyboodon prolifer</i> , Agassiz, ..	..	..	..	..	..	..	f	f	+	..	..	..
85	<i>Margellum octopunctatum</i> , Sars, ..	..	..	..	..	..	..	..	..	f	..	..	..
86	<i>Sarsia</i> sp., .. ..	..	..	..	..	..	..	+	+	..	..	+	..
87	<i>Obelia</i> sp., .. ..	..	..	..	..	..	ff	..	..	..	..	..	..
88	<i>Phialidium cymbalodium</i> , E. T. B., ..	..	..	..	..	..	..	..	..	..	..	..	..
89	— <i>temporarium</i> , E. T. B., ..	..	..	..	..	..	..	..	..	..	..	..	..
90	<i>Beros ovata</i> , Bosc., ..	..	..	..	..	..	..	..	..	..	..	..	..
91	<i>Pleurobrachia plicus</i> , Fabr., ..	..	..	..	..	..	..	..	+	..	..	c	..
ECHINODERMATA.														
92	<i>Ophiurid</i> juv., .. ..	..	..	..	..	..	f	..	..	..	..	..	..
VERMES.														
93	<i>Polychaete</i> larvae,	f	..	..	..	..	..	f	f	f	..	..	..
94	<i>Sagitta bipunctata</i> , Q. et G., ..	ff	+	cc	+	ff	..	..	..	..	ff	..	..
95	<i>Tomopteris belgolandica</i> Greef, ..	..	..	..	..	..	..	..	..	..	..	..	..
96	<i>Terebellid</i> larvae, .. ..	..	..	..	..	..	..	..	..	..	f	..	..
COPEPODA.														
97	<i>Acartia Clausi</i> (Giesbr.), ..	+	f	+	c	c	f	..	+	f	f	c	c	
98	— <i>longiremis</i> , Lillj., .. ..	..	..	..	..	..	..	f	..	..	..	..	..
99	<i>Alteutha bopyroides</i> , Claus, ..	..	..	..	ff	..	..	..	..	..	..	ff	..
100	<i>Anomalocera Pattersoni</i> , R. Temp., ..	..	..	..	..	..	..	..	..	..	cc	+	..
101	<i>Bradydium armatus</i> , Van-höfen, ..	..	..	..	..	..	f	..	..	f	..	..	..
102	<i>Calanus finmarchicus</i> , Gunn., ..	+	+	+	+	+	..	f	+	+	f	f	c	
103	<i>Centropages bairdii</i> (Lillj.), ..	..	..	..	..	..	f	+	+	+	..	c	c
104	— <i>typicus</i> , Kröyer, .. ..	..	..	..	..	..	..	..	..	..	..	c	..
105	<i>Diaxis pygmaea</i> , Scott, .. ..	..	..	..	..	..	..	..	..	..	..	..	..
106	<i>Dorypygus</i> sp., .. ..	..	..	..	ff	..	..	..	..	..	..	..	..
107	<i>Hemicecia Danae</i> , Clap., .. ..	..	..	..	..	..	..	..	ff	..	..	..	..
108	<i>Isias clavipes</i> (Boeck), .. ..	..	..	..	..	..	..	..	..	..	ff	..	..
109	<i>Labidocera Wollastoni</i> , (Lubb.), ..	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 54° 32' N., Long. 5° 25' W. 20 Fathoms.

July.		August.		September.		October.		November.		December.		Species No.	
13.	26.	12.	27.	12.	26.	10.	25.	8.	24.	8.	23.		
7.30 a.m.	8.45 p.m.	8.10 p.m.	8.25 p.m.	9.0 p.m.	8.45 p.m.	8.10 p.m.	8.0 p.m.	8.15 p.m.	7.40 a.m.	7.55 a.m.	8.15 p.m.		
13	24	15	26	17	28	19	20	21	22	23	24	COELENTERATA.	
+	+	r	..	..	..	..	..	..	..	..	..	<i>Corymorpha nutans</i> , Sars.	82
..	..	rr	rr	..	..	..	..	..	..	..	..	<i>Diporeia halterata</i> , Forbes.	83
..	..	..	..	..	..	..	..	..	..	..	..	<i>Hybocodon proliter</i> , Agassiz.	84
..	..	..	..	..	..	..	..	..	..	..	..	<i>Margellium octopunctatum</i> , Sars.	85
+	+	r	..	..	..	..	..	..	..	..	..	<i>Sarsia</i> sp.	86
rr	+	..	..	..	..	..	..	..	..	..	..	<i>Obelia</i> sp.	87
r	r	..	..	..	..	..	..	..	..	..	..	<i>Phialidium cymbalodum</i> , E. T. B.	88
..	..	..	..	r	r	..	..	..	..	..	..	— <i>temporatum</i> , E. T. B.	89
rr	..	..	..	rr	..	+	..	..	..	..	..	<i>Beros ovata</i> , Bosc.	90
+	c	c	c	+	+	c	c	+	..	r	..	<i>Pleurobrachia pilcus</i> , Fabr.	91
												ECHINODERMATA.	
..	..	..	..	..	..	..	..	..	..	..	..	<i>Ophiurid</i> juv.	92
												VERMES.	
..	..	..	r	r	r	r	..	..	..	..	..	<i>Polychaete</i> larvae.	93
..	c	cc	cc	cc	cc	cc	cc	cc	c	+	+	<i>Sagitta bipunctata</i> , Q. et G.	94
..	..	..	rr	rr	+	+	r	r	..	..	r	<i>Tomopteris heigelandica</i> Greef.	95
..	..	..	..	..	..	..	..	..	..	..	..	<i>Terebellid</i> larvae.	96
												COPEPODA.	
+	+	+	+	c	c	c	c	c	c	c	c	<i>Acartia Clausi</i> (Giesbr.).	97
..	..	..	..	..	..	..	..	..	..	..	..	— <i>longiremis</i> , Lillj.	98
..	r	+	+	r	..	..	..	..	..	..	..	<i>Alteutha bopyroides</i> , Claus.	99
..	r	c	+	+	+	..	..	..	..	..	..	<i>Anomalocera Pattersoni</i> , R. Temp.	100
..	..	..	..	..	..	r	r	..	..	..	..	<i>Bradydium armatus</i> , Vanhöffen.	101
r	+	c	cc	cc	c	cc	c	+	c	c	c	<i>Calanus famarchicus</i> , Gunn.	102
..	c	c	..	rr	r	+	..	..	..	..	..	<i>Centropages hamatus</i> (Lillj.)	103
+	+	..	..	..	r	+	..	..	..	..	..	— <i>typicus</i> , Kroyer.	104
..	..	..	..	..	..	..	..	..	rr	..	..	<i>Dialxis pygmaea</i> , Scott.	105
..	..	..	..	..	..	..	..	..	..	..	..	<i>Dorypygus</i> sp.	106
..	..	..	..	..	..	..	..	..	..	..	..	<i>Haemocera Danas</i> , Clap.	107
..	+	c	c	c	c	+	r	..	..	..	..	<i>Isis clavipes</i> (Boeck).	108
..	..	..	rr	..	+	..	..	..	..	..	..	<i>Labidocera Wollastoni</i> , (Lubb.).	109

SKULMARTIN LIGHTSHIP—continued.

Species No.	—	Jan.			February.			March.			April.		May.		June.	
		12. 10.30 a.m.	3. 8.30 a.m.	18. 8.0 a.m.	3. 8.30 a.m.	18. 8.30 a.m.	31. 7.30 a.m.	15. 6.30 a.m.	30. 7.40 a.m.	16. 8.0 a.m.	30. 8.30 a.m.	15. 8.15 a.m.	25. 3.10 p.m.	15. 8.15 a.m.	30. 8.30 a.m.	15. 8.15 a.m.
	COPEPODA—cont.	1	2	3	4	5	6	7	8	9	10	11	12			
110	<i>Longipedia coronata</i> , Claus.	..	+	..	..	..	..	+	..	..	..	..	..	..	..	..
111	<i>Metridia lucens</i> , Boeck.	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..
112	<i>Monstrilla</i> sp., ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
113	<i>Oithona nana</i> , Giesbr., ..	+	..	..	++	..	..	..	..	..	..	..	..	..	..	..
114	— similar, Claus.	..	..	..	+	+	..	..	..	..	..	..	..	..	..	+
115	<i>Paracalanus parvus</i> , Claus., ..	..	..	..	..	..	..	..	..	..	..	+	..	..	..	..
116	<i>Parapontella brevicornis</i> , Lubb.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	+
117	<i>Pseudocalanus elongatus</i> , Giesbr.,	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
118	<i>Temora longicornis</i> (O. F. Muller),	..	..	..	..	..	+	+	+	+	+	+	+	+	+	+
	CRUSTACEA (other).															
119	<i>Evadne Nordmanni</i> , Lovén.	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..
120	<i>Podon intermedius</i> , Lillj., ..	..	..	..	..	..	..	..	..	..	..	..	+	..	..	..
121	<i>Eurydice</i> sp., ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
122	Hyperiid, juv., ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
123	<i>Anchialus agilis</i> , Sars.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
124	<i>Schmoeysia ornata</i> , Sars.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
125	<i>Squilla crassipes</i> , Sars.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
126	<i>Nyctiphanes Couchi</i> , Bell.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
127	Cirriped larvae.	..	..	..	..	+	0	0	0	+	+	..	+	..	+	+
128	Cypris stage larvae.	..	..	..	..	..	++	+	+	+	+	+	+	+	+	+
129	Nauplius and metanauplius.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
130	Zoea, ..	..	..	..	+	+	+	+	+	..	..	..	+	..	+	+
131	Megalopa, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
132	Caridid larvae, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
133	<i>Panphos</i> sp. juv., ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	MOLLUSCA.															
134	Gastropod larvae, ..	..	..	..	+	+	+	+	+	+	+	+	+	+	+	+
135	Lamellibranchiate larvae, ..	+	+	..	+	+	+	+	+	+	+	+	+	+	+	+
	TUNICATA.															
136	<i>Oikopleura dioica</i> , Fol., ..	..	..	..	+	+	..	..	+	+	+	+	+	+	+	+
	VERTEBRATA.															
137	Teleostei, ova et larvae ..	..	..	..	+	+	+	0	+	0	0	..	+	0	0	0

IRISH LIGHT STATIONS, 1904—continued.

Lat. 54° 32' N., Long. 5° 25' W. 20 Fathoms.

July.		August.		September.		October.		November.		December.		Specimen No.
13.	28.	12.	27.	12.	26.	10.	25.	8.	24.	8.	23.	
7.30 a.m.	8.45 p.m.	8.10 p.m.	8.25 p.m.	9.0 p.m.	8.45 p.m.	8.10 p.m.	8.0 p.m.	8.15 p.m.	7.40 a.m.	7.55 a.m.	8.15 p.m.	
13	14	15	16	17	18	19	20	21	22	23	24	Copepoda—com.
r	r	r	r	r	+	..	..	..	..	..	..
..	c	c	+	+	+	c	?	..	..	..	..	Longipedia coronata, Claus.
..	..	..	..	..	..	..	..	..	..	..	..	Metridia lucens, Boeck.
..	..	..	..	..	..	..	..	..	..	..	..	Monastrella sp.
..	..	..	..	..	..	..	..	..	..	..	..	Oithona nana, Giesbr.
..	..	..	..	..	..	..	..	..	+	..	..	— similis, Claus.
..	..	..	..	..	c	r	?	..	..	..	..	Paracalanus parvus, Claus.
..	r	+	c	+	+	+	r	..	..	..	..	Parapontella brevicornis, Lubh.
r	c	cc	cc	cc	cc	c	c	c	+	c	c	Pseudocalanus elongatus, Giesbr.
..	c	c	c	c	c	c	+	..	..	..	..	Temora longicornis (O. F. Muller).
..	..	..	..	..	..	..	..	..	..	..	..	CRUSTACEA (Cetera).
..	
..	..	..	..	..	..	..	..	..	..	..	..	Eudae Nordmanni, Lovén.
..	..	..	..	..	..	..	..	..	..	..	..	Podon intermedius, Lillj.
..	..	..	..	..	..	..	..	..	..	..	..	Eurydice sp.
..	..	..	..	..	..	+	..	..	..	..	..	Hyperid, juv.
..	..	..	..	..	..	..	..	..	..	..	..	Anchialus agilis, Sars.
..	..	..	..	..	..	..	..	..	..	..	..	Schistomysis ornata, Sars.
..	..	..	..	..	..	..	..	..	..	..	..	Simella crassipes, Sars.
..	..	..	..	..	..	..	..	..	..	..	..	Nystiphanes Couchi, Bell.
..	..	..	..	..	..	..	..	..	..	..	..	Cirriped larvae.
..	..	..	..	..	..	..	..	..	..	..	..	Cypris stage larvae.
+	+	+	+	+	+	+	+	+	+	r	r	Nauphus and Metanauphus.
+	+	+	+	+	+	+	..	r	..	..	..	Zoea.
..	..	+	+	c	c	r	r	..	..	..	..	Megalopa.
..	r	+	+	+	+	+	+	..	..	..	..	Candid larvae.
..	..	..	..	..	..	..	..	..	..	..	+	Pagurus sp. juv.
..	..	..	..	..	..	..	..	..	..	..	..	MOLLUSCA.
..	
..	r	r	r	r	r	r	+	..	..	..	r	Gastropod larvae.
..	..	..	..	..	..	..	..	..	..	r	r	Lamellibranchiate larvae.
..	..	..	..	..	..	..	..	..	..	..	..	TUNICATA.
..	
r	r	+	..	..	r	..	..	..	..	..	..	Chiropleura dioica, Pol.
+	+	..	..	..	..	..	..	..	..	..	..	VERTEBRATA.
..	
+	+	r	r	..	..	r	..	..	..	..	..	Teleostei, ova et larvae.

SOUTH ARKLOW LIGHTSHIP.

Species No.	—	Feb.		March.		April.			May.		June.	July.	
		r. 7.30 a.m.	17. 8.45 a.m.	1. 8.35 a.m.	18. 9.35 p.m.	2. 8.30 a.m.	16. 7.30 a.m.	19. 7.0 a.m.	15. 8.30 a.m.	23. 7.0 a.m.	14. 8.30 a.m.	13. 7.0 a.m.	27. 7.0 a.m.
	DIAETOMACEAE.	1	2	3	4	5	6	7	8	9	10	11	12
1	Achnanthes sp., ..	..	..	r	..	c	r	r	r	r	..	..	..
2	Actinopteryx undulatus, Ehb.,	c	c	c	+	+	+	c	+	c	+	c	r
3	Asterionella glacialis, Castr.,	..	rr	rr	r	rr	rr	r	r	+	..	..	..
4	Bacillaria paradoxa (Gmel.), Grun.,	r	+	+	..	c	c	c	r	r	r	r	r
5	Bellerophon malleus, (Btw.), v. Heurck.,	..	rr	..	..	r	..	r	r	..	..	..	..
6	Biddulphia alternans, (Bail.), v. Heurck.,	..	..	..	..	..	..	..	..	..	..	..	..
7	— aurita, (Lyngb.), Brth.,	..	..	r	r	r	+	+	r	..	..	..	..
8	— fava, (Ehb.), v. Heurck.,	..	..	..	..	..	..	..	..	..	..	..	..
9	— granulata, Roper, ..	..	..	..	rr	..	..	r	r	rr	..	..	..
10	— mobilis, Bail., ..	+	+	+	r	+	+	c	r	c	+	r	rr
11	Ceratulina Bergoni, Pérac.,	..	..	..	..	..	r	..	..	..	..	..	..
12	Chaetoceros curvisetum, Cleve,	..	rr	..	..	..	..	..	..	..	..	..	..
13	— danicum, Cleve, ..	..	..	..	..	r	..	..	..	rr	..	..	..
14	— debile (?), Cleve, ..	..	..	..	..	..	..	..	..	..	..	..	..
15	— decipiens, Cleve, ..	r	r	r	r	..	r	r	..	r	r	..	..
16	— densum, Cleve, ..	..	..	..	..	..	..	..	..	..	..	..	..
17	— didymum (Ehb.), Cleve, rr	..	..	..	..	..	..	..	..	..	..	..	..
18	— laciniosum, Schütt, ..	..	..	..	..	..	..	..	..	rr	..	..	..
19	— Schütt, Cleve, ..	..	rr	..	..	..	..	..	..	..	..	..	..
20	Corethron hystrix, Hensen,	..	..	..	..	..	..	r	..	..	..	..	..
21	Coscinodiscus coscinus, W. Sm.,	r	r	r	r	+	+	c	r	r	..	rr	..
22	— excentrica, Ehb., ..	c	c	c	c	c	c	c	+	+	r	+	r
23	— radiatus, Ehb., ..	c	c	c	c	cc	c	c	c	c	c	c	+
24	Didymum Brightwell, West.,	..	r	..	..	rr	..	+	+	+	+	..	..
25	Fragilaria c.f. oceanica, Grun.,	..	rr	r	..	..	..	..	..	..	..	..	..
26	Gomarcha fasciata, Pérac., ..	r	r	..	..	..	rr	rr	..	rr	+	+	+
27	Hyalodiscus stelliger, Bail.,	c	c	c	c	c	r	c	+	c	+	+	r
28	Lauderia borealis, Grun., ..	..	..	..	..	..	+	r	+	c	r	..	..
29	Lithodesmium undulatum, Ehb.,	..	rr	..	..	..	..	..	..	..	..	..	..
30	Navicula membranacea, Cleve,	..	..	..	..	..	..	..	..	..	..	..	..
31	Paralia sulcata, (Ehb.), Cleve,	+	+	c	+	+	+	+	+	+	+	+	+

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 40' N., Long. 5° 56' W. 26 Fathoms.

August.		September.		October.		November.		December.		Species No.
12.	28.	9.	24.	10.	26.	7.	23.	7.	22.	
8.0 a.m.	8.40 a.m.	7.0 a.m.	7.34 p.m.	8.0 a.m.	8.30 a.m.	6.30 p.m.	7.0 p.m.	7.20 p.m.	6.45 a.m.	
13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	
—	—	—	—	—	—	—	—	—	—	DIATOMACEAE.
—	—	—	—	—	—	—	—	—	—	<i>Achnanthes</i> sp.
—	—	—	—	—	—	—	—	—	—	<i>Actinopteryx undulatus</i> , Ehb.
—	—	—	—	—	—	—	—	—	—	<i>Asterionella glacialis</i> , Castr.
—	—	—	—	—	—	—	—	—	—	<i>Bacillaria paradoxa</i> (Gmel.), Grun.
—	—	—	—	—	—	—	—	—	—	<i>Bellerophon malleus</i> , (Btw.), v. Heurck.
—	—	—	—	—	—	—	—	—	—	<i>Biddulphia alternans</i> , (Bail.), v. Heurck.
—	—	—	—	—	—	—	—	—	—	— <i>aurea</i> (Lyagh.), Brth.
—	—	—	—	—	—	—	—	—	—	— <i>*fusus</i> , (Ehb.), v. Heurck.
—	—	—	—	—	—	—	—	—	—	— <i>granulata</i> , Roper.
—	—	—	—	—	—	—	—	—	—	— <i>mobiliensis</i> , Bail.
—	—	—	—	—	—	—	—	—	—	<i>Ceratoluna Bergoni</i> , Pérac.
—	—	—	—	—	—	—	—	—	—	<i>Chaetoceros curviretus</i> , Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>danicum</i> , Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>debile</i> (?), Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>deceps</i> , Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>densum</i> , Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>didymum</i> , (Ehb.), Cleve.
—	—	—	—	—	—	—	—	—	—	— <i>laciniosum</i> , Schütt.
—	—	—	—	—	—	—	—	—	—	— Schütt., Cleve.
—	—	—	—	—	—	—	—	—	—	<i>Coetron hystrix</i> , Hensen.
—	—	—	—	—	—	—	—	—	—	<i>Coscinodiscus concinnus</i> , W. Sm.
—	—	—	—	—	—	—	—	—	—	— <i>excentricus</i> , Ehb.
—	—	—	—	—	—	—	—	—	—	— <i>radiatus</i> , Ehb.
—	—	—	—	—	—	—	—	—	—	<i>Ditylum Brightwelli</i> , West.
—	—	—	—	—	—	—	—	—	—	<i>Fragilaria</i> s.l. <i>oceanica</i> , Grun.
—	—	—	—	—	—	—	—	—	—	<i>Gunnardia facida</i> Pérac.
—	—	—	—	—	—	—	—	—	—	<i>Hyalodiscus stelliger</i> , Bnd.
—	—	—	—	—	—	—	—	—	—	<i>Lauderia borealis</i> , Grun.
—	—	—	—	—	—	—	—	—	—	<i>Lithodesmium undulatum</i> , Ehb.
—	—	—	—	—	—	—	—	—	—	<i>Navicula membranacea</i> , Cleve.
—	—	—	—	—	—	—	—	—	—	<i>Paralia sulcata</i> , (Ehb.), Cleve.

* *B. fusus* is not a plankton organism.

SOUTH ARKLOW LIGHTSHIP—continued.

Species No.		Feb.		March.		April.			May.		June.		July.	
		1.	17.	1.	18.	2.	16.	29.	16.	29.	14.	15.	27.	
		7.30 a.m.	8.45 a.m.	8.23 a.m.	9.35 p.m.	8.30 a.m.	7.50 a.m.	7.0 a.m.	8.30 a.m.	7.0 a.m.	8.30 a.m.	7.0 a.m.	7.0 a.m.	
	DIATOMACEAE—cont.	1	2	3	4	5	6	7	8	9	10	11	12	
37	<i>Pleurosigma</i> sp., ..	r	r	+	..	r	r		+	r	r	r	r	
38	<i>Rhizosolenia alata</i> , Btw., ..	..	..	..	..	..	..	..	..	..	r	..	..
39	— <i>semispina</i> , Hensen, ..	..	r	rr	..	..	..	..	..	..	r	+	..
40	— <i>setigera</i> , Btw., ..	..	..	..	r	..	r	r	r	+	+	..	..
41	— <i>Shrubsolei</i> , Cleve, ..	..	..	..	..	..	..	r	r	+	+	r	..
42	— <i>Stolterjochi</i> , Pérag., ..	..	..	..	..	..	..	rr	..	..	r	c	r
43	<i>Skeletonema costatum</i> , (Grev.) Cleve, ..	..	..	..	..	..	r	r	..	..	..	..	..
44	<i>Stephanopyxis turris</i> , (Grev.) Rabh., ..	..	..	..	..	..	..	..	..	..	..	..	..
45	<i>Streptotheca tamesia</i> , (Sbr.) Cleve, ..	r	+	r	r	+	+	+	+	c	c	+	+	
46	<i>Thalassiodira gravida</i> , Cleve, ..	..	..	r	..	..	..	r	..	..	..	..	..
47	— <i>Nordenföldi</i> , Cleve, ..	..	..	..	..	..	..	..	r	..	..	..	..
48	— <i>curvata</i> , Cost., ..	r	r	r	..	..	+	rr	r	rr	rr	..	..
49	— <i>Fraencklii</i> , Grun., ..	+	+	r	r	r	r	+	+	c	r	..	rr	
	PRASINIDAE.													
50	<i>Ceratium furca</i> , Clap. & Lachm., ..	rr	..	r	..	..	rr	r	r	r	r	r	+
51	— <i>fusus</i> , (Ehbg.), Dufr., ..	+	..	+	..	..	..	rr	..	..	..	..	rr
52	— <i>harridum</i> , Cleve, ..	..	..	..	r	..	..	..	..	..	r	r	..
53	— <i>longipes</i> , (Bail.), Cleve, ..	+	+	+	..	r	..	..	..	..	r	..	..
54	— <i>tripos</i> (O. F. Mill.) Vanhöfen, ..	r	r	..	..	..	..	..	..	..	..	..	..
55	<i>Dinophysis rotundata</i> , Clap. & Lachm., ..	..	..	..	..	..	..	..	..	..	..	..	..
56	<i>Diplopsalis lentacula</i> , Bergh., ..	rr	..	..	..	..	..	..	r	..	..	..	rr
57	<i>Pendulum coelestem</i> , Grun., ..	..	..	..	..	r	rr	r	r	..	..	..	..
58	— <i>decipiens</i> , Jörg., ..	..	..	..	..	..	..	..	..	..	..	r	rr
59	— <i>depressum</i> , Bail., ..	..	r	..	r	..	..	..	..	..	r	+	c
60	— <i>globulus</i> , Strin., ..	..	..	..	..	..	..	..	..	..	..	+	r
61	— <i>ovatum</i> , (Pouch.) Schütt., ..	..	..	..	..	..	..	rr	..	..	r	+	cc
62	— <i>pollidum</i> , Ostent., ..	..	..	..	..	..	..	rr	..	..	r	..	r
63	— <i>pentagonum</i> , Grun., ..	rr	r	r	..	..	..	..	..	..	r	+	rr
64	— <i>Steini</i> , Jörg., ..	..	..	..	..	..	..	..	..	..	..	r	r
65	— <i>n. sp.</i>, ..	..	..	..	..	..	..	..	..	..	..	..	r
66	<i>Prorocentrum micans</i> , Ehbg., ..	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 40' N., Long. 5° 56' W. 26 Fathoms.

August.		September.		October.		November.		December.		Species No.
13. 8.0 a.m.	23. 8.40 a.m.	9. 7.0 a.m.	24. 7.34 p.m.	10. 8.0 a.m.	26. 8.20 a.m.	7. 6.50 p.m.	23. 7.0 p.m.	7. 7.10 p.m.	22. 6.45 a.m.	
13	14	15	16	17	18	19	20	21	22	
..	..	IT	..	F	F	F	F	DIATOMACEAE—cont. <i>Pleurosigma</i> sp. <i>Rhizosolenia alata</i> , Btw. — <i>semispina</i> , Hensen. — <i>setigera</i> , Btw. — <i>Shrubsolei</i> , Cleve. — <i>Stolterfothi</i> , Pérag. <i>Skeletonema costatum</i> , (Grev.), Cleve. <i>Stephanopyxis turris</i> , (Grev.), Ralfs. <i>Streptotheca tenebra</i> , (Str.), Cleve. <i>Thalassiosira gravida</i> , Cleve. — <i>Nordenskiöldi</i> , Cleve. — <i>curvata</i> , Castr. — <i>Frauenfeldi</i> , Grun.
..	
+	IT	..	..	..	..	..	..	..	..
..	..	..	..	F	F	..	..	..	..
..	
..	..	..	..	..	..	..	..	..	IT
..	
+	+	+	F	F	+	F	C	+	C	
..	
..	
..	..	..	..	..	F	..	..	..	IT
..	..	..	..	..	F	F	F	..	IT
F	+	+	F	F	+	+	+	F	+	PERIDINIDAE. <i>Ceratium furca</i> , Clap. & Lachm. — <i>furca</i> , (Ebbg.), Duj. — <i>hornum</i> , Cleve. — <i>longipes</i> , (Bail.), Cleve. — <i>tripes</i> , (O. F. Müll.), Vanhöfen. <i>Dinophysis rotundata</i> , Clap. & Lachm. <i>Diplopsalis lenticula</i> , Bergh. <i>Peridinium concavum</i> , Grun. — <i>decipiens</i> , Jörg. — <i>depressum</i> , Bail. — <i>globulus</i> , Stein. — <i>ovatum</i> , (Pouch.), Schutt. — <i>pallidum</i> , Ostenf. — <i>pentagonum</i> , Grun. — <i>Steini</i> , Jörg. — <i>n. sp.</i> <i>Prorocentrum micans</i> , Ebbg.
..	IT	F	..	F	F	F	F	..	F	
..	
F	+	F	F	F	F	F	F	..	..
..	IT	F	F	..	..	..	..	..	..
..	..	F	..	F	..	..	..	..	..
..	IT	+	F	+	F	F	..	..	IT
..	
C	C	+	+	..	..	..	..	..	..
..	..	..	..	..	IT	..	..	IT	..
S	C	+	+	F	F	F	..	F	..	
..	
..	..	IT	..	..	..	..	..	..	..
..	
F	..	..	..	..	..	..	..	..	..
F	..	..	F	..	..	..	..	F	..

SOUTH ARKLOW LIGHTSHIP—continued.

Species No.	_____	Feb.		March.		April.			May.		June.		July.	
		1. 7.30 a.m.	17 8.45 a.m.	3. 8.23 a.m.	15. 9.35 p.m.	2. 8.30 a.m.	16. 7.30 a.m.	29. 7.0 a.m.	16. 8.30 a.m.	29. 7.0 a.m.	14. 8.30 a.m.	13. 7.0 a.m.	27. 7.0 a.m.	
	FLAGELLATAE.	1	2	3	4	5	6	7	8	9	10	11	12	
62	<i>Dinobryon pellucidum</i> , Lev.,	..	..	..	+	+	..	+	..	+	..	..	..
	COCCOPHRAEALAE.													
63	<i>Coccosphaera</i> "atlantica", Ostroff.	..	..	..	..	..	..	..	..	..	..	..	..
	PROTOCOCCOPHRAEAE.													
64	<i>Halesphara viridis</i> , Schmitz.	+	+	+	+	+	..	..	..	..	..	..	..
65	<i>Hexastria problematica</i> , Cleve,	..	with 7 processes +	with 8 processes +	..	..	+	..	with 7 processes +	..	..	..	..
66	<i>Trochiscia Clevei</i> , Lemm., ..	+	+	+	+	..	+	+	..	+	..	+	+	
67	— <i>paucispinosa</i> , (Cleve), Lemm.,	..	..	..	+	+	+	+	..	..	+	..	..
	SILICIFLAGELLATAE.													
68	<i>Dictyocha fibula</i> , Ehrh., ..	+	+	..	..	..	..	+	..	+	..	..	..
	INCERTAE SEDIS.													
69	" <i>Unirindia</i> Cystis," Hensen,	+	+	+	+	+	..	..	..	+	..	..	..
70	" <i>Barbierbeckensia taylori</i> ," Hensen,	..	..	..	..	..	+	..	..	..	..	..	..
	PROTOZOA.													
71	<i>Amphorella subulata</i> , (Ehrh.), Daday,	..	+	..	..	..	..	..	..	..	..	..	..
72	<i>Ptychoclis unius</i> , (Clap. & Lachm.),	..	..	..	..	..	..	..	..	..	..	..	..
73	<i>Tintinnopsis borealis</i> , Sten.,	+	+	..	..	+	+	+	+	..	+	+	+
74	— <i>campanula</i> (Ehrh.), Dad.,	..	..	..	..	..	..	..	..	..	..	..	..
75	<i>Noctiluca miliaris</i> , Surirey, ..	..	..	..	..	..	..	..	..	..	..	..	+
76	<i>Rhaphidophrys marina</i> , Ostroff.	..	..	..	..	..	..	..	..	..	..	..	..
	COELETERATA.													
77	<i>Sarcia</i> sp., ..	..	..	..	..	..	..	..	+	..	..	..	..
78	<i>Thana pilosa</i> , Agassiz, ..	..	..	..	..	..	..	..	..	..	..	..	..
79	<i>Phialidium temporarium</i> , B. T. B.,	..	..	..	..	..	..	..	..	..	..	+	+
80	<i>Gosia corymbosa</i> , Agassiz,	..	..	..	..	..	..	..	..	..	..	..	..
81	<i>Copula Sarsi</i> , Haeckel, ..	..	..	..	..	..	..	..	..	..	..	..	..
82	<i>Maggiæa atlantica</i> , Cunning- ham,	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 40' N., Long. 5° 56' W. 26 Fathoms.

August.		September.		October.		November.		December.		Species No.
12.	25.	9.	24.	10.	26.	7.	23.	7.	22.	
8.0 a.m.	8.40 a.m.	7.0 a.m.	7.34 p.m.	8.0 a.m.	8.20 a.m.	8.50 p.m.	7.0 p.m.	7.50 p.m.	6.45 a.m.	
13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	
..	..	..	..	..	..	..	..	..	..	FLAGELLATAE.
										<i>Dinobryon petlundum</i> , Lev.
		+	..	+	+	+	+	F	F	COCOSPHAERAE.
										<i>Coccosphaera</i> * <i>atlantica</i> , Ostenf.
..	..	..	II	..	II	..	..	..	..	PROTOCOCCIDAE.
										<i>Halosphaera viridis</i> , Schmitz.
..	..	..	..	..	..	..	..	..	..	<i>Hexasterias problematica</i> , Cleve.
..	..	..	..	..	..	..	..	II	..	<i>Trochiscia Clevei</i> , Lemm.
+	+	+	F	+	+	F	F	..	F	— <i>paucispinosa</i> , (Cleve), Lemm.
..	..	..	..	II	..	II	..	..	II	SILICOFAGELLATAE.
										<i>Dicthyocha fibula</i> , Ebbg.
..	..	..	..	..	..	..	..	II	II	INCERTAE SEDIS.
										" <i>Unriatede Cyste</i> ," Hensen.
..	..	..	..	..	..	..	..	..	..	"<i>Barbierbeckmattoblast</i> ," Hensen.
..	..	..	..	..	..	..	..	..	..	PROTOZOA.
										<i>Amphorella sabulata</i> , (Ebbg.), Daday.
II	F	..	+	..	..	..	..	..	..	<i>Ptychocyllis urcula</i> , (Clap. & Lachm.)
+	C	C	C	F	F	+	+	+	+	<i>Tintinnopsis beroides</i> , Stein.
F	II	..	..	..	..	F	F	..	..	— <i>campanula</i> (Ebbg.), Dad.
F	F	C	+	..	..	..	..	..	..	<i>Noctiluca miliaris</i> , Surirey.
..	..	..	..	..	..	..	..	..	?	<i>Rhabdiodiaphrys marina</i> , Ostenf.
..	..	..	F	..	..	..	..	..	..	CORLESTERATA.
										<i>Sarsia</i> sp.
II	II	..	..	..	..	..	..	..	..	<i>Tiara pileata</i> , Agassiz.
C	C	+	..	..	..	..	..	..	..	<i>Phialidium temporarium</i> , B. T. B.
..	..	..	F	..	..	+	F	..	..	<i>Gosson corymbosa</i> , Agassiz.
..	..	..	..	..	..	..	..	F	..	<i>Cupulita Sarsi</i> , Haeckel.
..	..	F	+	..	..	..	..	..	..	<i>Maggiara atlantica</i> , Cunningham.

* *Coccosphaera atlantica* was only recorded when complete cells were observed.

SOUTH ARKLOW LIGHTSHIP—continued.

Species No.	—	Feb.		March.		April.			May.		June.	July.	
		1. 7.30 a.m.	17. 8.45 a.m.	3. 8.25 a.m.	18. 9.75 p.m.	2. 8.30 a.m.	16. 7.30 a.m.	29. 7.0 a.m.	16. 8.30 a.m.	29. 7.0 a.m.	14. 8.30 a.m.	13. 7.0 a.m.	27. 7.3 a.m.
	COELENTERATA—con.	r	2	3	4	5	6	7	8	9	10	11	12
83	<i>Beroë ovata</i> , Bosc., ..	..	..	..	..	..	..	..	..	..	..	..	..
84	<i>Pleurobrachia pulex</i> , Fabr., ..	..	..	..	..	..	..	..	1	1	..	1	+
	ECHINODERMATA.												
85	<i>Auricellaria</i>, .. ..	..	..	..	..	..	11	..	..	..	..	..	..
86	<i>Bipinnaria</i>, .. ..	..	..	..	..	..	..	..	..	..	..	11	..
	VERMES.												
87a	<i>Autolytus prolixis</i> (Müll.), ..	..	+	+	+	+	+	..	..	..	..	..	..
87b	<i>Polychæte</i> larvae, ..	..	1	..	..	..	..	..	..	..	1	1	+
88	<i>Sagitta bipunctata</i> , Q. et G., ..	..	+	+	+	+	1	..	1	1	1	1	..
89	<i>Tomopteris belgolandica</i> , Grœf., ..	..	11	..	..	..	..	..	..	..	..	..	..
90	<i>Terebellid</i> larvae, .. ..	..	..	..	..	..	..	..	+	+	1	..	..
	BRACHIOPODA.												
91	<i>Cyphonautes</i> ,	11	11	11	1	..	..	1	..	+	..	..	..
	COPPEPODA.												
92	<i>Acartia Clausi</i> (Giesbr.), ..	1	11	..	..	1	1	+	+	+	1	1	1
93	<i>Alteutha bopyroides</i> , Claus, ..	..	11	..	..	..	..	..	..	1	1	1	..
94	<i>Anomalocera Pattersoni</i> , R. Temp., ..	..	..	..	..	..	..	..	..	11	..	..	..
95	<i>Bradydus armatus</i> , Van-höffen., ..	..	..	..	11	..	..	..	1	..	..	..	..
96	<i>Calanus fumarchicus</i> , Guzm., ..	..	c	+	c	c	1	+	+	+	+	11	..
97	<i>Candacia pectinata</i> , Brady, ..	..	..	..	..	..	..	..	..	1	..	..	..
98	<i>Centropages hamatus</i> , (Lillj.), ..	+	1	..	?	c	c	+	c	c	+	c	c
99	— typicus, Kroyer, ..	1	..	11	..	..	..	..	11	..	..	..	..
100	<i>Corycaeus anglicus</i> , Lubbo., ..	11	..	11	..	..	..	..	..	..	..	..	..
101	<i>Euterpæ acutifrons</i> , Dana, ..	..	..	..	..	..	..	..	..	..	..	..	..
102	<i>Isis clavipes</i> , (Boeck), ..	..	..	..	..	..	..	..	..	..	..	..	..
103	<i>Labidocera Wollastoni</i> , (Lubbo.), ..	..	..	..	..	..	1 juv.	..	..	..	..	..	..
104	<i>Longipedia coronata</i> , Claus, ..	..	..	..	..	..	..	..	..	..	1	..	..
105	<i>Metridia lucasæ</i> , Boeck, ..	..	1	+	+	+	..	..	1	+	..	..	..
106	<i>Oithona nama</i> , Giesbr., ..	..	..	..	..	..	..	..	..	..	..	..	..
107	— similis, Claus, ..	..	..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 40' N., Long. 5° 56' W. 26 Fathoms.

August.		September.		October.		November.		December.		Species No.
12.	28.	9.	24.	10.	26.	7.	23.	7.	22.	
8.0 a.m.	5.40 a.m.	7.0 a.m.	7.34 p.m.	8.0 a.m.	5.10 a.m.	6.30 p.m.	7.0 p.m.	7.10 p.m.	6.45 a.m.	
13.	14.	15.	16.	27.	28.	19.	20.	21.	22.	COELENTERATA—cont.
..	+	+	+	..	
+	+	+	+	..	..	+	+	+	..	<i>Beroë ovata</i> , Borg.
..	..	..	..	..	..	..	..	..	..	<i>Pleurotrachia galeus</i> , Fabr.
..	..	..	..	..	..	..	..	..	..	ECHINODERMATA.
..	..	..	..	..	..	..	..	..	..	<i>Auricularia</i> .
..	..	..	..	..	..	..	..	..	..	<i>Diptonaria</i> .
..	..	..	..	..	..	..	..	..	..	VERMES.
..	..	..	..	..	..	..	..	..	..	<i>Austolytus prolifer</i> (Müll.).
+	..	..	..	+	+	+	+	..	..	<i>Polychaete</i> larvae.
+	..	..	..	+	+	+	..	..	..	<i>Sagitta bipunctata</i> , Q. et G.
..	..	..	+	..	..	+	+	+	+	<i>Tomopteris belgolandica</i> , Grell.
..	..	..	..	..	..	..	..	..	..	<i>Terebellid</i> larvae.
+	+	+	..	..	+	..	..	..	..	BRYOZOA.
..	..	..	..	..	..	..	..	..	..	<i>Cyphonautes</i> .
..	..	..	..	..	..	..	..	..	..	COPEPODA.
+	+	+	+	+	+	+	+	+	+	<i>Acartia Claus</i> (Giesbr.).
+	+	+	+	+	+	..	..	+	+	<i>Alteutha bopyroides</i> , Claus.
..	..	..	..	..	..	..	..	..	..	<i>Anomalocera</i> Pattersoni, R. Temp.
..	..	..	..	..	..	..	..	..	..	<i>Bradydus armatus</i> , Vanhoffen.
+	..	+	+	+	+	+	+	+	+	<i>Calanus finmarchicus</i> , Goss.
..	..	..	..	..	..	..	..	..	..	<i>Candacia pectinata</i> , Brady.
+	+	+	+	+	+	+	+	+	+	<i>Centropages hamatus</i> (Lillj.).
..	+	+	+	+	+	+	..	..	..	— typicus, Kroyer.
..	..	..	..	..	..	..	..	..	..	<i>Corycaeus anglicus</i> , Lubb.
..	..	+	..	+	+	+	+	..	..	<i>Euterpia acanthifrons</i> , Dana.
..	..	+	+	..	..	..	..	..	..	<i>Isas clavipes</i> , (Boeck).
..	..	..	..	..	..	..	..	..	..	<i>Labidocera Wollastoni</i> , (Lubb.).
..	..	..	..	..	..	..	..	..	..	<i>Longipedia coronata</i> , Claus.
..	..	..	..	..	..	..	..	..	..	<i>Metridia lucens</i> , Boeck.
..	..	+	..	..	..	..	..	..	..	<i>Oithona dana</i> , Giesbr.
..	..	+	..	..	..	..	..	..	..	— similis, Claus.

SOUTH ARKLOW LIGHTSHIP—continued.

Specimen No.		February.		March.		April.			May.		June.	July.	
		1. 7-30 a.m.	17. 8-45 a.m.	3. 8-23 a.m.	18. 9-35 p.m.	2. 8-30 a.m.	16. 7-30 a.m.	29. 7-0 a.m.	16. 8-30 a.m.	29. 7-0 a.m.	14. 8-30 a.m.	13. 7-0 a.m.	27. 7-8 a.m.
	COELENTERATA—CON.	1	2	3	4	5	6	7	8	9	10	11	12
106	<i>Parapentella brevicornis</i> , Lebb.	..	..	..	..	..	..	ff	f	f	..	..	f
109	<i>Pseudocalanus elongatus</i> , Boeck.	ff	c	+	c	c	+	cc	c	c	+	f	f
110	<i>Temora longicornis</i> (O. F. Müller).	..	..	f	+	+	+	cc	c	c	+	c	c
	CRUSTACEA (CETERA).												
111	<i>Eurydice inermis</i> Hansen, ..	..	..	..	..	..	..	..	..	..	..	..	..
112	———— <i>spinigera</i> , Hansen,	..	..	..	..	..	..	..	..	..	..	..	..
113	<i>Hypocid</i> juv., ..	..	..	..	..	..	..	..	..	..	..	..	..
114	<i>Anchialus agilis</i> , Sars, ..	..	..	..	f	..	..	..	..	..	..	..	..
115	<i>Gastrosaccus Normani</i> , Sars,	..	..	..	..	..	..	..	..	..	..	..	..
116	———— <i>sanctus</i> , v. Ben., ..	..	..	..	f	..	..	..	..	..	..	..	..
117	<i>Siriella armata</i> , Sars, ..	..	..	..	..	..	..	..	..	..	..	..	..
118	<i>Schistomysis spiritus</i> ,* Norman	..	..	..	..	..	..	..	..	..	..	..	..
119	<i>Nyctiphanes Couchi</i> , Bell, ..	..	..	..	..	..	..	..	..	..	..	..	..
120	<i>Paniphae</i> sp. juv., ..	..	..	..	..	..	..	..	..	..	..	..	..
121	<i>Cirripedia</i> larvae, ..	..	..	..	..	f	f	f	f	f	f	..	..
122	<i>Cypis</i> stage larvae, ..	..	..	..	..	..	..	+	f	f	f	..	..
123	<i>Microisous</i>, ..	..	..	..	..	..	..	..	..	ff	..	..	..
124	<i>Caridid</i> larvae, ..	..	..	..	..	..	..	..	..	..	..	..	..
125	<i>Nauplius</i> and <i>Metanauplius</i> ,	f,	f	f	f	+	+	+	+	+	+	..	..
126	<i>Zoea</i>, ..	..	ff	+	+	+	..	f	..	f	..	f	f
127	<i>Megalopa</i>, ..	..	..	..	..	..	..	..	..	..	..	ff	..
	MOLLUSCA.												
128	<i>Gastropod</i> larvae, ..	..	..	..	..	..	..	f	..	f	..	+	..
129	<i>Lamellibranchiate</i> larvae, ..	..	..	+	..	..	..	..	..	..	+	+	+
	TUNICATA.												
130	<i>Prigillaria borealis</i> , Q. et G.	..	..	..	..	..	..	..	..	..	..	f	..
131	<i>Oikopleura dioica</i> , Foll, ..	..	..	..	..	..	ff	..	..	f	..	f	f
	VERTEBRATE.												
132	<i>Teleostei</i> , ova et larvae, ..	..	ff	f	f	c	+	c	+	+	f	f	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 40' N., Long. 5° 56' W. 26 Fathoms.

August.		September.		October.		November.		December.			No. of specimens.
22. 8.0 a.m.	28. 8.40 a.m.	9. 7.0 a.m.	24. 7.14 p.m.	10. 8.0 a.m.	26. 8.20 a.m.	7. 6.50 p.m.	23. 7.0 p.m.	7. 7.20 p.m.	22. 6.45 a.m.		
13	14	15	16	17	18	19	20	21	22		
+	+	r	cc	r	r	+	r	rr	..	<i>Copepoda</i> — <i>cos.</i>	
..	..	+	r	e	r	+	+	..	+	<i>Parapontella brevicornis</i> , Lubb.	108
..	..	..	..	..	..	..	..	..	..	<i>Pseudocalanus elongatus</i> , Boeck.	109
c	c	c	cc	c	+	r	r	+	r	<i>Temora longicornis</i> (O. F. Muller).	110
										<i>CRUSTACEA</i> (OTHERS).	
..	..	..	r	..	..	..	..	..	..	<i>Eurydice merula</i> , Hansen.	111
..	..	..	rr	..	..	..	..	..	..	— <i>spingeri</i> , Hansen.	112
..	..	..	r	..	..	..	..	..	..	Hyperiid juv.	113
..	..	..	..	..	..	..	..	..	..	<i>Anchialus agilis</i> , Sars.	114
..	..	..	+	..	..	..	..	..	..	<i>Gastrosaccus Normani</i> , Sars.	115
..	..	..	r	..	..	..	..	..	..	— <i>sanctus</i> , v. Ben.	116
..	..	..	rr	..	..	..	..	..	..	<i>Sinella armata</i> , Sars.	117
..	..	..	..	..	..	cc	+	cc	r	<i>Schistomysis spinatus</i> ,* Norman.	118
..	..	..	+	..	..	+	+	+	..	<i>Nyctophanes Couchi</i> , Bell.	119
..	..	..	..	..	..	rr	..	..	..	<i>Psalphas</i> sp. juv.	120
rr	r	r	..	..	..	..	..	..	..	<i>Crepidula</i> larvae.	121
..	..	..	..	..	..	..	r	..	..	Cypid stage larvae.	122
..	..	..	..	..	..	..	..	..	..	<i>Microniscus</i> .	123
+	+	+	r	..	..	..	..	..	..	Caridid larvae.	124
r	r	r	+	+	+	+	+	r	r	Nauplius and Metanauplius.	125
rr	rr	r	+	..	..	..	..	..	rr	Zoea.	126
										<i>Megalopa</i> .	127
										<i>MOLLUSCA</i> .	
..	..	..	..	..	..	..	..	..	..	Gastropod larvae.	128
+	+	+	..	..	r	..	..	..	..	Lamellibranchiate larvae.	129
										<i>Tunicata</i> .	
..	..	..	..	..	..	..	..	..	rr	<i>Fritillaria borealis</i> , Q. et G.	130
r	r	+	..	..	..	rr	rr	rr	rr	<i>Othopleura dioica</i> , Foll.	131
										<i>VERTEBRATE</i> .	
r	r	..	..	..	..	..	..	..	..	Teleostei ova et larvae.	132

* All the specimens were immature, but seem to belong to this species.

PLANETON COLLECTED AT

CONINGBEG LIGHTSHIP.

Species No.	—	January.		February.				March.	
		19.	19.	1.	2.	15.	16.	2.	3.
		7-0 a.m.	7-30 p.m.	5-25 p.m.	5-34 a.m.	7-24 a.m.	7-40 p.m.	2-40 a.m.	5-2 p.m.
	DIATOMACEÆ.	1	2	3	4	5	6	7	8
1	<i>Achnanthes</i> sp., .. ..	..	..	..	..	IT	+	+	+
2	<i>Actinopteryx undulatus</i> , Ehbg.,	..	+	..	IT	+	..	+	..
3	<i>Actinocyclus glacialis</i> , Castr., ..	..	..	..	..	..	..	..	..
4	<i>Bartharia paradoxa</i> , (Gmel.), Gran.,	..	..	..	..	..	..	..	..
5	<i>Biddulphia mobilensis</i> , Bail.,	c	c	..	+	c	+	c	c
6	<i>Ceratolus Bergoni</i> , Pérac., ..	..	..	..	..	..	..	..	..
7	<i>Chaetoceros borealis</i> , Bail., ..	..	..	..	..	..	..	..	..
8	— <i>constrictum</i> , Gran., ..	..	..	..	..	..	..	..	..
9	— <i>crinitum</i> , Gran., ..	..	..	..	..	IT	..	..	..
10	— <i>danicum</i> , Cleve., ..	..	..	..	..	..	..	..	..
11	— <i>decipiens</i> , Cleve., ..	+	+	..	..	IT	..	..	..
12	— <i>densum</i> , Cleve., ..	..	..	..	..	..	..	..	..
13	— <i>laciniosum</i> , Schütt., ..	..	..	..	..	..	..	..	..
14	— <i>Schütt.</i> , Cleve., ..	..	IT	..	..	..	..	..	..
15	<i>Cocconeis laticostata</i> , Hensen, ..	..	..	..	..	..	..	..	..
16	<i>Cocconeis concinna</i> , W. Sm.,	+	+	+	+	+	+	+	+
17	— <i>excavata</i> , Ehbg., ..	+	+	..	..	+	+	+	+
18	— <i>oculus iridis</i> , Ehbg., ..	..	..	..	+	..	..	+	IT
19	— <i>radiatus</i> , Ehbg., ..	+	+	+	+	..	..	..	..
20	<i>Cocconeis polychoeta</i> , Gran.,	..	..	..	..	..	..	..	..
21	<i>Ditylum Brightwelli</i> , West., ..	..	..	..	..	..	..	..	..
22	<i>Guinardia florida</i> , Pérac., ..	..	..	..	..	..	..	..	..
23	<i>Hyalodiscus stelliger</i> , Bail., ..	c	c	+	+	cc	c	c	+
24	<i>Lauderia borealis</i> , Gran., ..	..	..	..	..	..	..	..	..
25	<i>Navicula membranacea</i> , Cleve.,	..	..	..	..	..	..	..	..
26	<i>Nitzschia seriata</i> , Cleve., ..	..	..	..	..	..	..	IT	..
27	<i>Paralia sulcata</i> , (Ehbg.), Cleve.,	+	+	+	+	+	+	+	+
28	<i>Pleurosigma</i> sp., .. ..	+	+	..	..	IT	..	..	..
29	<i>Rhizosolenia alata</i> , Btw., ..	..	IT	..	..	IT	+	..	..
30	— <i>semispina</i> , Hensen, ..	+	+	..	..	..	..	..	..
31	— <i>setigera</i> , Btw., ..	..	..	..	+	+	IT	..	..
32	— <i>Sarabocleis</i> , Cleve., ..	..	..	..	..	..	..	..	..
33	— <i>Stellaris</i> , Pérac., ..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

March.			April.		May.		Species No.
17. 2.32 a.m.	17. 3.8 p.m.	31. 2.46 p.m.	15. 2.35 a.m.	30. 2.40 a.m.	15. 2.25 a.m.	29. 2.23 a.m.	
9	10	11	12	13	14	15	
DIATOMACEÆ.							
..	F	F	..	+	..	..	<i>Achnanthes</i> sp. 1
F	..	F	+	..	..	..	<i>Actinopteryx undulatus</i> , Ehb. 2
..	..	+	..	..	..	..	<i>Asterionella glacialis</i> , Ehb. 3
..	F	F	..	..	..	..	<i>Bacillaria paradoxa</i> , (Gmel.), Grun. 4
+	+	C	+	+	..	..	<i>Biddulphia mobiliensis</i> , Bail. 5
..	..	..	..	..	..	..	<i>Ceratolus Bergoni</i> , Pér. 6
..	..	..	..	..	..	..	<i>Chartoceras boreale</i> , Bail. 7
..	..	F	..	..	..	..	— <i>constrictum</i> , Grun. 8
..	..	..	..	..	..	..	— <i>crinitum</i> , Grun. 9
..	..	FF	..	..	..	..	— <i>danicum</i> , Cleve. 10
..	..	..	..	..	..	..	— <i>deciplens</i> , Cleve. 11
..	..	..	..	..	..	..	— <i>densum</i> , Cleve. 12
..	..	..	..	..	..	..	— <i>faciosum</i> , Schütt. 13
..	..	FF	..	..	..	..	— <i>Schütt.</i> , Cleve. 14
..	..	F	..	..	..	..	<i>Corethron hystrix</i> , Hensen. 15
..	F	F	..	..	..	..	<i>Coscinodiscus concinnus</i> , W. Sm. 16
+	F	C	F	F	..	F	— <i>excentricus</i> , Ehb. 17
..	..	..	..	..	..	..	— <i>oculus undia</i> , Ehb. 18
..	..	F	FF	F	..	F	— <i>radiatus</i> , Ehb. 19
..	C	C	..	..	..	..	<i>Coscinodiscus polychorda</i> , Grun. 20
..	F	+	..	..	..	..	<i>Ditylum Brightwelli</i> , West. 21
..	..	..	..	..	..	..	<i>Guinardia flaccida</i> , Pér. 22
+	+	+	C	C	+	..	<i>Hyalodiscus stelliger</i> , Bail. 23
..	..	+	..	..	..	..	<i>Lauderia borealis</i> , Grun. 24
..	..	..	..	..	..	..	<i>Navicula membranacea</i> , Cleve. 25
..	..	FF	..	..	..	..	<i>Nitzschia seriata</i> , Cleve. 26
+	F	+	+	+	..	..	<i>Paralia sulcata</i> , (Ehb.), Cleve. 27
..	..	..	..	..	..	..	<i>Pleurosigma</i> sp. 28
..	..	..	..	..	..	..	<i>Rhinosolenia alata</i> , Brw. 29
..	..	FF	..	..	..	..	— <i>semispina</i> , Hensen. 30
..	..	..	..	..	..	..	— <i>setigera</i> , Brw. 31
..	..	..	..	..	..	..	— <i>Shrubsolei</i> , Cleve. 32
..	..	..	..	..	..	..	— <i>Stolterfothi</i> , Pér. 33

PLANKTON COLLECTED AT

CONINGBEG LIGHTSHIP—continued.

Species No.	—	June.		July.		August.		September.	
		15.	27.	15.	27.	12.	26.	10.	24.
		2.25 a.m.	2.29 p.m.	2.25 a.m.	2.34 a.m.	2.55 a.m.	*	2.59 d.m.	2.36 p.m.
	DIATOMACEAE.	16	17	18	19	20	21	22	23
1	<i>Achnanthes</i> sp. . . . .	..	..	..	..	..	..	..	..
2	<i>Actinopteryx undulatus</i> , Ebbg.,	1	..	..	17	..	..	..	..
3	<i>Asterionella glacialis</i> , Castr.,	17	17	..	..	..	..	..	..
4	<i>Bacillaria paradoxa</i> , (Gmel.), Grin,	..	..	..	..	..	..	..	..
5	<i>Biddulphia mobilensis</i> , Ball., ..	..	..	..	..	..	..	17	..
6	<i>Ceratofina Bergoni</i> , Pérac., ..	..	..	..	..	..	..	1	..
7	<i>Chaetoceros boreale</i> , Ball., ..	..	..	..	..	..	..	+	..
8	— <i>constrictum</i> , Grin,	..	..	..	..	..	..	..	..
9	— <i>crinitum</i> , Grin,	..	..	..	..	..	..	..	..
10	— <i>danicum</i> , Cleve,	..	..	..	..	..	..	17	..
11	— <i>deciptens</i> , Cleve,	..	..	..	..	..	..	..	..
12	— <i>densum</i> , Cleve,	..	..	..	..	..	..	..	..
13	— <i>lachnorum</i> , Schütt.,	..	..	..	..	..	..	..	..
14	— <i>Schütt.</i> , Cleve,	..	..	17	..	..	..	17	..
15	<i>Corethron hystrix</i> , Heussen, ..	..	..	..	..	..	..	17	..
16	<i>Coscinodiscus concinnus</i> , W. Sm.,	..	..	..	..	..	..	..	..
17	— <i>eccentricus</i> , Ebbg.,	..	1	..	17	..	..	..	..
18	— <i>oculus iridis</i> , Ebbg.,	..	..	..	..	..	..	..	..
19	— <i>radiatus</i> , Ebbg.,	1	..	17	1	..	..	..	..
20	<i>Coscinotira polychorda</i> , Grin,	..	..	..	..	..	..	..	..
21	<i>Ditylum Brightwelli</i> , West., ..	..	..	..	..	..	..	17	..
22	<i>Gulnartha, falcata</i> , Pérac., ..	..	..	..	..	..	..	+	..
23	<i>Hyalodiscus stelliger</i> , Ball., ..	1	1	..	1	1	..	1	..
24	<i>Lauderia borealis</i> , Grin,	..	..	..	..	..	..	..	..
25	<i>Navicula membranacea</i> , Cleve,	..	..	..	..	..	..	1	..
26	<i>Nitzschia seriata</i> , Cleve,	1	..	..	..	..	..	..	..
27	<i>Paralia sulcata</i> , (Ebbg.), Cleve,	..	1	1	1	1	..	+	17
28	<i>Pleurosigma</i> sp., ..	..	1	..	..	1	..	1	..
29	<i>Rhizosolenia alata</i> , Bw., ..	..	..	..	..	..	..	+	..
30	— <i>semispina</i> , Hensen, ..	1	+	+	..	..	..	..	..
31	— <i>setigera</i> , Bw.,	..	..	..	..	..	..	..	..
32	— <i>Strubdeli</i> , Cleve,	..	17	17	..	..	..	1	17
33	— <i>Stolterflothi</i> , Pérac., ..	..	..	..	..	..	..	+	..

* Both samples totally macerated.

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

October.		November.		December.		Species No.
9.	25.	8.	23.	7.	23.	
2.13 a.m.	2.54 a.m.	2.39 a.m.	2.28 a.m.	2.22 a.m.	2.49 a.m.	—
24	25	26	27	28	29	DIATOMACEAE.
..	<i>Achnanthes</i> sp.
..	<i>Actinopteryx undulatus</i> , Ehb.
IT	<i>Asterionella glacialis</i> , Castr.
..	<i>Bacillaria paradoxa</i> , (Gmel.), Gran.
..	IT	..	+	<i>Biddulphia mobilis</i> , Bail.
..	<i>Ceratoluna Bergoni</i> , Pér.
..	+	<i>Chaetoceros borealis</i> , Bail.
..	— <i>constrictum</i> , Gran.
..	— <i>crinitum</i> , Gran.
..	— <i>danicum</i> , Cleve.
..	— <i>decipiens</i> , Cleve.
..	+	+	+	— <i>densum</i> , Cleve.
..	IT	..	— <i>lucinosum</i> , Schütt.
..	— Schütt., Cleve.
..	<i>Corethron hystrix</i> , Hensen.
..	IT	..	<i>Coscinodiscus condannus</i> , W. Sm.
+	..	+	+	+	+	— <i>excentricus</i> , Ehb.
..	— <i>oculus iridis</i> , Ehb.
..	+	+	..	— <i>radiatus</i> , Ehb.
..	<i>Coscinostira polychorda</i> , Gran.
..	<i>Ditylum Brightwelli</i> , West.
..	<i>Gomoneis flaccida</i> , Pér.
+	+	+	+	+	+	<i>Hyalodiscus stelliger</i> , Bail.
..	<i>Lauderia borealis</i> , Gran.
..	<i>Navicula membranacea</i> , Cleve.
..	<i>Nitzschia seriata</i> , Cleve.
+	+	+	+	+	+	<i>Paralia sulcata</i> , (Ehb.), Cleve.
..	IT	..	+	<i>Pleurosigma</i> sp.
+	+	..	+	IT	+	<i>Rhizosolenia alata</i> , Btw.
..	+	— <i>semispora</i> , Hensen.
..	— <i>setigera</i> , Btw.
..	IT	..	..	— <i>Shrubsolei</i> , Cleve.
+	— <i>Stolterfothi</i> , Pér.

PLANKTON COLLECTED AT

CONINGBEG LIGHTSHIP—continued.

Species No.		January.		February.				March.	
		19.	19.	1.	2.	15.	16.	2.	2.
		7.0 a.m.	7.30 p.m.	5.25 p.m.	5.54 a.m.	7.24 a.m.	7.40 p.m.	2.40 a.m.	3.2 p.m.
	DIATOMACEAE—cont.	1	2	3	4	5	6	7	8
34	<i>Skeletonema costatum</i> , (Grev.), Cleve, ..	..	..	..	..	..	..	..	..
35	<i>Streplotheca tamesis</i> , (Shr.), Cleve, ..	..	..	..	..	..	..	..	..
36	<i>Thalassiosira gelatinosa</i> , Hansen, ..	..	..	..	..	..	..	..	..
37	— <i>gravidula</i> , Cleve, ..	..	..	..	..	..	..	..	+
38	<i>Thalassiothrix curvata</i> , Castr., ..	+	+	..	..	+	+	++	+
39	— <i>Frauenfeldii</i> , Grun., ..	..	+	+	..	+	+	++	+
	PERIDINIDAE.								
40	<i>Ceratium laves</i> , (Ehbg.), DuJ., ..	+	+	..	..	..	..	..	..
41	— <i>longipes</i> , (Bail.), Cleve, ..	+	+	++	..	++	..	..	++
42	— <i>horridum</i> , Cleve, ..	..	..	..	..	..	..	..	..
43	— <i>tripes</i> , (C. F. Müll.), Vanhöffen, ..	+	+	..	..	..	..	..	..
44	<i>Dinophysis acuminata</i> , Clap. & Lachm., ..	..	..	..	..	..	..	..	..
45	— <i>rotundata</i> , Clap. & Lachm., ..	..	..	..	..	..	..	..	..
46	<i>Diplopsalis lentacula</i> , Bergh, ..	..	++	..	..	..	..	..	..
47	<i>Glenodinium acuminatum</i> , Ehbg., ..	..	..	..	..	..	..	..	..
48	<i>Gonyaulax polygramma</i> , Stein, ..	..	..	..	..	..	..	..	..
49	<i>Pendinium conicum</i> , Grun., ..	..	..	..	..	..	..	..	..
50	— <i>decipiens</i> , Jörg., ..	..	..	..	..	..	..	..	..
51	— <i>depressum</i> , Bail., ..	..	+	+	..	..	++	++	..
52	— <i>globula</i> , Stein, ..	..	..	..	..	..	..	..	..
53	— <i>conicum</i> , (Vanhöffen), ..	..	+	..	+	+	..	..	..
54	— <i>ovatum</i> , (Fouchet), Schütt, ..	..	..	..	..	..	..	..	..
55	— <i>pallidum</i> , Ostens., ..	..	++	..	++	..	..	..	..
56	— <i>pentagonum</i> , Grun., ..	..	++	++	..	..	..	..	..
57	<i>Prorocentrum micans</i> , Ehbg., ..	..	..	..	..	..	..	..	..
	PROTOCOCCIDAE.								
58	<i>Halosphaera viridis</i> , Schmitz, ..	+	+	+	+	+	+	+	+
59	<i>Trochiscia Clevei</i> , Lemm., ..	..	..	..	..	..	..	..	..
60	— <i>brachiolata</i> , (Möb.), Lemm., ..	..	..	..	..	..	..	..	..
61	— <i>paucispinosa</i> , (Cleve), Lemm., ..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

March.			April.		May.		Species No.
17.	17.	31.	15.	30.	15.	29.	
2.52 a.m.	3.8 p.m.	2.40 p.m.	2.35 a.m.	2.40 a.m.	2.25 a.m.	2.25 a.m.	
9	10	11	12	13	14	15	
..	..	ff	..	..	..	..
DIATOMACEAE—con.							
Sceletonema costatum, (Grev.), Cleve.							34
Streptotheca tamedis, (Shr.), Cleve.							35
Thalassionira gelatinosa, Hensen.							36
— gravida, Cleve.							37
Thalassiothrix curvata, Cost.							38
— Fraenfeldt, Grun.							39
PERIDINIDAE.							
Ceratum fusus, (Ehbg.), Doj.							40
— longipes, (Bail.), Cleve.							41
— horridum, Cleve.							42
— tripos, (O. F. Müll.), Vanhöffen.							43
Dinophysis acuminata, Clap. & Lachm.							44
— rotundata, Clap. & Lachm.							45
Diptopsalis lenticula, Bergh.							46
Glenodinium acuminatum, Ehbg.							47
Gonyaulax polygramma, Stein.							48
Peridinium conicum, Gran.							49
— decipiens, Jörg.							50
— depressum, Bail.							51
— globulus, Stein.							52
— octanum, (Vanhöffen.)							53
— ovatum, (Pouchet), Schüdt.							54
— pallidum, Ostref.							55
— pentagonum, Gran.							56
Protoconium micans, Ehbg.							57
PROTOCOCCIDAE.							
Halosphaera viridis, Schmetz.							58
Trochiscia Clevei, Lemm.							59
— brachiolata, (Meb.), Lemm.							60
— paucispinosa, (Cleve), Lemm.							61

CONINGBEG LIGHTSHIP—continued.

Species No.	—	June.		July.		August.		September.	
		13.	27.	13.	27.	12.	26.	10.	24.
		2.23 a.m.	2.29 a.m.	2.23 a.m.	2.34 a.m.	2.55 a.m.	*	2.59 p.m.	2.36 p.m.
	DIATOMACEAE—con.	16	17	18	19	20	21	22	23
34	<i>Skeletonema costatum</i> , (Grev.), Cleve,	..	ff	..	..	..	..	..	..
35	<i>Streplotheca tamesis</i> , (Shr.), Cleve,	..	..	f	..	..	..	+	..
36	<i>Thalassiosira gelatinosa</i> , Hensen,	..	..	..	..	..	..	..	..
37	— <i>gracilis</i> , Cleve,	..	f	..	..	..	..	..	..
38	<i>Thalassiothrix curvata</i> , Castr.,	..	..	..	..	..	..	..	..
39	— <i>Frauenfeldi</i> , Grun.,	..	ff	ff	..	..	..	ff	..
	PERIDINIDAE.								
40	<i>Ceratium fusus</i> , (Ehbg.), Duj.,	f	..	..	..	..	..	ff	..
41	— <i>longipes</i> , (Bail.), Cleve, ..	..	..	..	..	..	..	f	ff
42	— <i>horridum</i> , Cleve,	..	f	..	..	..	..	..	..
43	— <i>tripes</i> , (O. F. Müll.), Van-höffen,	f	..	..	..	..	..	f	f
44	<i>Dinophysis acuminata</i> , Clap. & Lachn.,	..	..	..	..	..	..	ff	..
45	— <i>rotundata</i> , Clap. & Lachn.,	..	..	..	..	..	..	..	..
46	<i>Diptopalea lenticula</i> , Bergh,	..	..	ff	f	..	..	ff	..
47	<i>Glenodinium acuminatum</i> , Ehbg.,	..	..	ff	..	..	..	..	..
48	<i>Gonyaulax polygramma</i> , Stein,	..	..	ff	..	..	..	..	..
49	<i>Peridinium concinnum</i> , Grun.,	..	..	..	..	..	..	..	..
50	— <i>decipiens</i> , Jorg.,	..	..	ff	..	..	..	..	..
51	— <i>depressum</i> , Bail.,	..	f	..	ff	ff	..	..	..
52	— <i>globulm</i> , Stein,	..	+	f	ff	..	..	..	..
53	— <i>oceanicum</i> , (Vanhöffen),	..	..	..	..	..	..	..	..
54	— <i>ovatum</i> , (Pouchet), Schmitt,	+	f	+	f	..	..	ff	..
55	— <i>polidum</i> , Ostent.,	..	f	f	..	..	..	..	..
56	— <i>pentagonum</i> , Grun.,	..	..	..	ff	..	..	..	..
57	<i>Prorocentrum micans</i> , Ehbg.,	..	f	f	+	f	..	+	..
	PROTODUCODIDAE.								
58	<i>Halosphaera viridis</i> , Schmitt,	..	..	..	..	..	..	ff	ff
59	<i>Trochiscia Clevei</i> , Lemm.,	..	..	f	f	..	..	..	..
60	— <i>brachiolata</i> , (Steb.), Lemm.,	..	..	..	..	..	..	..	..
61	— <i>paucispinosa</i> , (Cleve), Lemm.,	..	f	..	..	..	..	..	..

* Both samples totally macerated.

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

October.		November.		December.		—	Species No.
9. 7-13 a.m.	25. 2-54 a.m.	8. 2-39 a.m.	21. 2-28 a.m.	7. 2-22 a.m.	23. 2-49 a.m.		
24	25	26	27	28	29	DIATOMACEAE—con.	
..	..	..	..	..	..	<i>Societonema costatum</i> , (Grev.), Cleve.	34
..	f	..	..	..	f	<i>Streptotheca tarmis</i> , (Shr.), Cleve.	35
..	..	..	..	..	..	<i>Thalassouira gelatinosa</i> , Hensen.	36
..	..	..	..	..	..	— <i>gravida</i> , Cleve.	37
..	..	..	..	..	f	<i>Thalassiothrix curvata</i> , Castr.	38
..	..	..	..	..	f	— <i>Frauenfeldi</i> , Grun.	39
						PERIDINIDAE.	
..	..	..	..	..	..	<i>Ceratium fusus</i> , (Ehbg.), Duj.	40
f	f	..	..	..	f	— <i>longipes</i> , (Bail.), Cleve.	41
..	f	f	f	..	f	— <i>horridum</i> , Cleve.	42
f	+	+	+	+	c	— <i>tripes</i> (O. F. Mull.), Vanhöffen.	43
..	..	..	..	..	..	<i>Dinophysis acuminata</i> , Clap. & Lachm.	44
..	..	..	..	..	..	— <i>rotundata</i> , Clap. & Lachm.	45
..	f	..	..	..	f	<i>Diplopalis lenticula</i> , Bergh.	46
..	..	..	..	..	..	<i>Glenodinium acuminatum</i> , Ehbg.	47
..	..	..	..	..	..	<i>Gonyaulax polygramma</i> , Stein.	48
..	..	..	..	..	..	<i>Peridinium conicum</i> , Grun.	49
..	..	..	..	..	..	— <i>decipiens</i> , Jorg.	50
..	+	f	..	f	+	— <i>depressum</i> , Bail.	51
..	..	..	..	..	..	— <i>globulus</i> , Stein.	52
..	..	..	..	..	..	— <i>oceanicum</i> , (Vanhöffen).	53
..	..	..	..	..	..	— <i>ovatum</i> (Fouquet), Schütt.	54
..	..	..	..	..	..	— <i>pallidum</i> , Ostend.	55
..	f	..	..	..	..	— <i>pentagonum</i> , Grun.	56
..	..	..	..	..	..	<i>Proocentrum micum</i> , Ehbg.	57
						PROROCENTRIDAE.	
..	+	+	+	+	c	<i>Halosphaera viridis</i> , Schmitz.	
..	..	..	..	..	..	<i>Trochiscia Clevei</i> , Lemm.	59
..	..	..	..	..	..	— <i>brachiolata</i> (Mob.), Lemm.	60
..	..	..	..	..	..	— <i>paucispinosa</i> , (Cleve), Lemm.	61

CONINGBEG LIGHTSHIP—continued.

Species No.	—	January.		February.				March.	
		19. 7-0 a.m.	19. 7-30 p.m.	1. 5-28 p.m.	2. 5-34 a.m.	15. 7-24 a.m.	16. 7-40 p.m.	2. 2-40 a.m.	2. 3-2 p.m.
	INCERTA SEDIS.	1	2	3	4	5	6	7	8
62	"Umrindete Cyste," Hansen.	..	..	r	1	r	+	c	+
62a	Hexasterias problematica, Cleve.	..	..	..	..	rr	..	..	..
	PROTOZOA.								
63	Lithomelissa sp.,	rr	..	..	..	rr	..	..	..
64	Cyttarocylis norvegica, (Daday), Jørgensen.	..	..	..	..	..	..	..	..
65	Tintinnopsis boreidea, Stein, ..	r	+	..	rr	..	..	rr	..
	COELENTERATA.								
66	Lar sabellarum, Giese, ..	..	..	..	..	..	..	..	..
67	Hybocodon prolifer, Agassiz.	..	..	..	..	..	..	..	..
68	Tiara pileata, Fork., ..	..	..	..	..	..	..	..	..
69	Obeha sp., .. ..	..	..	..	..	..	..	..	..
70	Phialidium cymbaloideum, E. T. B.	..	..	..	..	..	..	..	..
71	— temporarium, E. T. B., ..	..	..	..	..	..	..	..	..
72	Aglantha rosea, Forbes, ..	..	..	..	r	+	..	..	..
73	Muggiaea atlantica, Cunningham.	..	..	..	..	..	..	..	..
74	Arachnactis [albida, M. Sars?].	..	..	..	..	..	..	..	..
75	Pleurobrachia pileus, Fabr., ..	..	..	..	..	..	..	..	..
	ECHINODERMATA.								
76	Auricularia, .. ..	..	..	..	..	rr	..	..	..
77	Echinopluteus, .. ..	..	..	..	..	..	..	..	..
78	Ophiopluteus, .. ..	..	..	..	..	r	..	..	..
79	Ophiurid juv., .. ..	..	..	..	..	..	..	rr	..
	VERMES.								
80	Pilidium, .. ..	..	..	..	..	..	rr	..	..
81	Polychaete larvae, .. ..	..	..	..	..	+	..	r	+
82	Sagitta bipunctata, Q. & G.,	+	c	c	c	+	c	+	c
83	Temnoptera belgolandica, Greef.,	..	..	c	c	+	+	r	c
84	Trochophora,	r	..	..	r	..	r	..	..
	BRACHIOPODA.								
85	Cyphoscutus, .. ..	..	..	..	rr	r	+	+	r

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

March.			April.		May.		Species No.
17. a.m.	17. p.m.	31. p.m.	15. a.m.	30. a.m.	15. a.m.	25. a.m.	
9	10	11	12	13	14	15	
..	F	..	..	..	INCERTAE SEDIS.
..	"Umbrinote Cyste," Hensen. 62
..	Hexasterias problematica, Cleve. 62a
..	PROTOZOA.
..	Lithomelasma sp. 63
..	Cyttarocylis norvegica, (Daday), Jørgensen. 64
..	FF	..	..	Tintinnopsis beroldea, Stein. 65
..	COELENTERATA.
..	Lar sabellarem, Gosse. 66
..	FF	..	Hybocodon prolifer, Agassiz. 67
..	Tiara pileata, Forsk. 68
..	F	F	F	..	..	..	Ochea sp. 69
..	Phaeidium cymbaloideum, E. T. B. 70
..	— temporarium, E. T. B. 71
..	Aglantha rosea, Forbes. 72
..	Mugilaeus atlantica, Cunningham. 73
..	Arachnoides [albida, M. Sars ?] 74
..	Pleurobrachia pileus, Fabr. 75
..	..	IF	..	..	..	..	ECHINODERMATA.
..	Auricularia. 76
..	Echinopluteus. 77
..	F	..	..	..	..	..	Ophiopluteus. 78
..	Ophiurid juv. 79
..	VERMES.
..	Pilidium. 80
F	Polychaete larvae. 81
G	F	..	G	..	+	+	Sagitta bipunctata, Q. & G. 82
F	FF	..	..	..	..	0	Tomopteris belgolandica, Greef. 83
..	Trochophora. 84
..	BRYOZOA.
..	Cyphonautes. 85

CONINGBEG LIGHTSHIP—continued.

Species no.	—	June.		July.		August.		September.	
		13. 2.23 a.m.	27. 2.29 p.m.	13. 2.23 a.m.	27. 2.34 a.m.	12. 2.55 a.m.	26. *	10. 2.39 p.m.	24. 2.16 p.m.
	INCESTAE SEDIS.	10	27	13	29	20	21	22	23
62	"Unidentified Cyst," Hensen,	..	..	..	..	..	..	..	..
62A	Hexasteria problematica, Cleve,	..	..	..	..	..	..	..	..
	PROTOZOA.								
63	Lithomelissa sp., .. ..	..	..	..	..	..	..	..	..
64	Cyttarocybus norvegica, (Daday), Jorgensen,	r	r	..	..	..	..	..	..
65	Tintinnopsis beroldea, Stein,	r	r	..	..	..	..	..	..
	CORLENTERATA.								
66	Lar sabellarum Gosse, ..	..	..	..	..	..	..	..	rr
67	Hybocodon prolifer, Agardh,	..	..	..	..	..	..	..	..
68	Tiara pileata, Forsk., ..	..	..	..	+	rr	..	..	..
69	Ochea sp., .. ..	..	..	..	..	..	..	r	..
70	Phthalidium cymbaloideum, E. T. B.,	..	..	..	..	..	..	..	r
71	— temporarium, E. T. B.,	..	..	..	..	..	..	+	+
72	Aglantha rosea, Forbes, ..	..	..	..	..	..	..	..	..
73	Mugilaea atlantica, Cunningham,	..	..	..	..	..	..	cc	cc
74	Arachnactis albida, M. Sars. ?),	rr	..	..	..	..	..	..	..
75	Pleurobrachia pileus, Fabr., ..	..	r	rr	..	..	..	..	..
76	Aureularia, .. ..	..	..	..	..	..	..	..	..
77	Echinopluteus, .. ..	..	..	..	..	..	..	r	..
78	Ophiopluteus, .. ..	..	..	..	..	..	..	..	r
79	Ophiurid juv., .. ..	..	..	..	..	..	..	..	..
	VERMES.								
80	Pilidium, .. ..	..	..	..	..	..	..	..	..
81	Polychaete larvae, .. ..	..	..	..	..	..	..	r	..
82	Sagitta bipunctata, Q. & G., ..	..	at night	r	c	+	..	+	+
83	Tomopteris belgolandica, Greef.,	..	..	..	..	r	..	..	+
84	Trochophora, .. ..	..	..	..	..	..	..	..	..
	BRACHIOPODA.								
85	Cyprina, .. ..	..	..	..	..	..	..	rr	..

* Both samples totally macerated.

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

October.		November.		December.		Species No.
9. 7.13 a.m.	25. 2.54 a.m.	8. 2.39 a.m.	23. 2.28 a.m.	7. 2.22 a.m.	23. 2.49 a.m.	
24	25	26	27	28	29	
..	INCERTAE SEDIS.
..	"Unriodate Cyst," Hansen.
..	Hexastenas problematica Cleve.
..	f	PROTOZOA.
..	Lithomelista sp.
..	Cyrtarocylis norvegica (Daday), Jørgensen.
..	Tintinnopsis borealis, Stein.
..	COELENTERATA.
..	Lar sabellarum, Gome.
..	Hybocodon prolifer, Agassiz.
..	Tiaris pileata, Forsk.
..	f	..	..	Obleia sp.
..	Phialidium cymbaloides, E. T. B.
..	f	..	..	— temporarium, E. T. B.
..	Aglantha rosea, Forbes.
c	c	f	+	+	c	Mugilopsis atlantica, Cunningham.
..	Arachnoidia [albida, M. Sars. ?].
..	Pleurobrachia pileus, Fabr.
..	ECHINODERMATA.
..	Auricularia.
..	Echinopluteus.
..	Ophiopluteus.
..	Ophurid juv.
..	VERMES.
..	Pilidium.
..	Polychaete larvae.
c	+	+	+	+	c	Sagitta bipunctata, Q. & G.
..	..	+	f	f	+	Tomopteris belgolandica, Greef.
..	Trochophora.
..	f	+	BRACHIOPODA.
..	f	+	Cyprinae.

PLANKTON COLLECTED AT

CONINGBEG LIGHTSHIP—continued.

Species No.	—	January.		February.				March.	
		19. 7.0 a.m.	19. 7.50 p.m.	1. 5.28 p.m.	1. 5.54 a.m.	15. 7.24 a.m.	16. 7.40 p.m.	2. 1.40 a.m.	2. 3.2 p.m.
	Copepoda.	1	2	3	4	5	6	7	8
86	Acartia Clam, Giesbr., ..	..	r	+	+	r	+	r	r
87	Aleutha bopyroides, Claus., ..	..	..	..	..	..	..	..	..
88	Anomalocera Pattersoni, R. Temp.	..	..	..	r	..	..	..	..
89	Bradydium armatus, Vanhöffen,	..	..	..	..	..	..	..	rr
90	Calanus finmarchicus, Gunn., ..	+	+	c	c	..	c	c	c
91	Canthocamptus pectinatus, Brady, ..	..	..	..	..	..	..	..	..
92	Centropages hamatus, Lillj., ..	..	..	..	..	..	..	..	..
93	— typicus, Kröyer, ..	+	+	+	+	r	+	r	r
94	Coercanus anglicus, Lubb., ..	+	+	+	+	r	c	r	rr
95	Dalmanella pygmaea, Scott, ..	..	..	..	..	..	..	..	r
96	Eurytemora acutifrons, Dana, ..	r	..	..	..	..	..	..	..
97	Metridia lucens, Boeck, ..	..	r	+	+	..	c	..	c
98	Microsetella atlantica, Brady, ..	r	r	r	r	rr	r	r	rr
99	Oithona dana, Giesbr., ..	..	r	..	..	rr	..	..	..
100	— similis, Claus, ..	c	c	r	+	cc	c	+	+
101	Paracalanus parvus, Claus, ..	+	+	..	..	..	+	r	?
102	Parapontella brevicornis, Lubb.,	..	..	..	..	rr juv.	..	..	..
103	Pseudocalanus elongatus, Boeck, ..	..	r	+	+	+	+	+	r
104	Temora longicornis (O. F. Müller),	..	r	..	..	..	..	..	..
	Crustacea (Cyclops).								
105	Eurytemora Nordmanni, Lovén, ..	..	..	..	..	..	..	..	..
106	Podon intermedius, Lillj., ..	..	..	..	..	..	..	..	..
107	Eurytemora inermis, Hansen, ..	..	..	..	..	..	..	..	..
108	Hyperid, (Eurytemora com- pressa, Giesbr.),	r	r	..	+	..	+	..	..
109	Gastrosaccus Nordmanni, Sars, ..	..	..	..	..	..	..	..	..
110	— sanctus, Sars, ..	..	..	..	..	..	..	..	..
111	Nyctiphanes Couchi, Bell, ..	..	..	..	..	..	..	..	..

PLANKTON COLLECTED AT

7. CONINGBEG LIGHTSHIP—continued.

Species No.	—	June.		July.		August.		September.	
		13. 2.23 a.m.	17. 2.20 p.m.	13. 2.23 a.m.	17. 2.14 a.m.	12. 2.55 a.m.	16. *	10. 2.50 p.m.	14. 2.36 p.m.
	COPEPODA.	10	17	13	19	20	21	22	23
86	Acartia Clausi, Giesbr., ..	+	c	+	r	+	..	+	+
87	Alteutha bopyroides, Claus, ..	..	..	..	..	..	..	..	..
88	Anomalocera Pattersoni, R. Temp.	+	+	..	+	r	..	c	..
89	Bradydus armatus, Vanhöffen, ..	..	..	..	..	..	..	..	..
90	Calanus finmarchicus, Gunn.,	cc	c at night cc	cc	cc	c	..	cc	cc
91	Candacia pectinata, Brady, ..	..	..	..	..	..	..	+	+
92	Centropages hamatus, Lillj., ..	c	+	r	rr	+	..	..	..
93	— typicus, Kröyer, ..	c	+	c	c	cc	..	c	c
94	Corycaeus anglicus, Lubb., ..	..	..	..	..	..	..	+	+
95	Dialxis pygmaea, Scott, ..	..	..	..	..	..	..	..	..
96	Euterna acutifrons, Dana, ..	..	..	..	..	..	..	..	..
97	Metridia lucens, Boeck, ..	cc	at night c	+	+	c	..	+	c
98	Microsetella atlantica, Brady, ..	..	..	..	..	..	..	..	..
99	Oithona nana, Giesbr., ..	..	..	..	..	..	..	..	..
100	— similis, Claus, ..	..	..	..	rr	r	..	..	..
101	Paracalanus parvus, Claus, ..	..	..	r	+	+	..	+	+
102	Parapostella brevicornis, Lubb., ..	..	..	..	..	..	..	..	..
103	Pseudocalanus elongatus, Boeck, ..	c	at night c	+	+	c	..	c	c
104	Temora longicornis (O. F. Müller), ..	..	..	+	+	c	..	+	+
	CRUSTACEA (OTHERS).								
105	Evadne Nordmanni, Lovén, ..	+	..	..	..	..	..	..	..
106	Podon intermedius, Lillj., ..	..	..	r	cc	c	..	+	r
107	Eurydice inermis, Hansen, ..	..	..	..	..	..	..	..	..
108	Hyperiid (Eothemisto compressa, Goes ?), ..	..	..	..	..	..	..	..	..
109	Gastrosaccus Normanii, Sars, ..	..	..	..	..	..	..	..	..
110	— sanctus, Sars, ..	..	..	..	..	..	..	..	..
111	Nyctiphanes Couchi, Bell, ..	..	..	..	..	..	..	..	..

* Both samples totally macerated.

IRISH LIGHT STATIONS, 1904—continued

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

October.		November.		December.		Species No.	
9. a.m.	25. a.m.	5. a.m.	23. a.m.	7. a.m.	23. a.m.		
24	25	26	27	28	29		
+	..	..	..	..	..	Copepoda.	
..	..	..	..	..	..	Acartia Clausi, Giesb.	86
..	c	..	..	..	..	Alteutha bopyroides, Claus.	87
..	..	..	..	..	..	Anomalocera Pattersoni, R. Temp.	88
..	..	..	..	..	..	Bradydium armatus, Vanhöffen.	89
cc	cc	cc	cc	cc	cc	Calanus finmarchicus Gunn.	90
+	..	..	..	..	r	Candacia pectinata, Brady.	91
..	..	..	..	..	..	Centropages hamatus, Lillj.	92
c	c	..	..	..	+	— typicus Kröyer.	93
c	c	c	c	c	+	Corycaeus anglicus, Lubb.	94
..	..	..	..	..	rr	Diaxia pygmaea, Scott.	95
..	..	..	..	..	..	Euterte acutifrons, Dana.	96
r	r	+	+	+	c	Metridia lucens, Boeck.	97
..	..	..	..	..	..	Microsetella atlantica, Brady.	98
..	..	..	..	..	..	Oithona nana, Giesb.	99
..	..	..	+	..	+	— similis, Claus.	100
..	+	..	..	..	r	Paracalanus parvus, Claus.	101
..	..	..	..	..	..	Parapontella brevicornis, Lubb.	102
c	c	+	c	c	c	Pseudocalanus elongatus, Boeck.	103
c	c	c	c	c	+	Temora longicornis (O. F. Müller).	104
						CRUSTACEA (CETERA).	
..	..	..	..	..	..	Evadne Noordmanni, Lovén.	105
..	..	..	..	..	..	Podon intermedius, Lillj.	106
..	..	r	..	..	..	Eurydice inermis, Hansen.	107
+	r	..	..	..	..	Hyperiid (Euthemisto compressa, Goes.?).	108
..	..	r	..	..	..	Gastrosaccus Normani, Sars.	109
+	..	r	+	c	..	— sanctus, Sars.	110
+	..	..	..	..	..	Nyctiphanes Couchi, Bell.	111

PLANKTON COLLECTED AT

CONINGBEG LIGHTSHIP—continued.

Species No.	—	January.		February.				March.	
		19. 7.0 a.m.	19. 7.30 p.m.	1. 5.28 p.m.	2. 5.54 a.m.	15. 7.24 a.m.	16. 7.40 p.m.	2. 2.40 a.m.	2. 5.2 p.m.
	CRUSTACEA (CETERA)—CON.	1	2	3	4	5	6	7	8
112	Cirripedia larvae, .. ..	..	..	..	..	..	f	f	f
113	Cypris stage larvae, .. ..	..	..	..	..	..	..	..	..
114	Microniscus, .. ..	..	..	..	..	..	..	..	IT
115	Nauplius & Metanauplius, ..	+	+	f	f	f	+	+	+
116	Zoea, .. ..	..	..	..	..	+	..	+	+
117	Megalopa, .. ..	..	..	..	..	..	..	..	..
118	Caridid larvae,	f	f	..	..	f	..	f	+
119	Homarus vulgaris, M.-Edw. larva,	..	..	..	..	..	..	..	..
	MOLLUSCA.								
120	Lamellibranchiate larvae, ..	f	f	..	..	f	0	+	f
121	Gastropod larvae, .. ..	..	f	..	..	f	+	..	..
	TUNNATA.								
122	Frillaria borealis, Q. et G., ..	..	..	..	..	..	..	..	..
123	Onkopleura docta, Pol,	f	..	..	..	..	..	..	..
	VERTEBRATA.								
124	Teleostei, ova et larvae,	f	..	..	0	+	+	f	f

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

March.			April.		May.		Species No.
17. 2.52 a.m.	17. 3.8 p.m.	31. 2.40 p.m.	15. 2.35 a.m.	30. 2.40 a.m.	15. 2.25 a.m.	29. 2.33 a.m.	
9	10	11	12	13	14	15	CRUSTACEA (OTHERA)—CON.
+	E	E	E	..	..	..	Cirripedia larvae. 112
EE	..	..	+	..	..	..	Cypris stage larvae. 113
..	EE	..	..	..	..	..	Micromysis. 114
+	+	+	E	E	E	E	Nauplius and Metanauplius. 115
E	..	E	E	E	E	+	Zoea. 116
..	..	..	..	..	..	..	Megalopa. 117
E	E	E	..	..	..	+	Cardid larvae. 118
..	..	..	..	..	..	..	Homarus vulgaris, M.-Edw. larva. 119
+	..	E	..	..	..	..	MOLLUSCA.
E	..	E	..	..	..	..	Lamellibranchiate larvae. 120
..	..	..	..	..	..	..	Gastropod larvae. 121
..	..	..	..	..	..	..	TUNICATA.
..	..	..	..	..	..	..	Fritillaria borealis, Q. & G. 122
..	..	..	..	..	..	..	Oikopleura dioica, Foll. 123
E	+	+	E	..	..	E	VERTEBRATA.
							Teleostei, ova et larvae. 124

PLANKTON COLLECTED AT

CONINGBEG LIGHTSHIP—continued.

Species No.	—	June.		July.		August.		September.	
		23. 2.23 a.m.	27. 2.29 a.m.	23. 2.23 a.m.	27. 2.34 a.m.	23. 2.55 a.m.	26. *	10. 2.59 p.m.	24. 2.36 p.m.
	CRUSTACEA (OTHERA)—CON.	10	17	18	19	20	21	22	23
112	Cirripedia larvae, .. ..	..	..	..	..	..	..	..	..
113	Cypris stage larvae, .. ..	..	..	..	..	..	..	..	..
114	Microniscus, .. ..	..	..	..	..	..	..	..	+
115	Nauplius and Metanauplius,	+	+	+	+	+	..	+	+
116	Zoea,	+	at night +	60	60	60	..	+	+
117	Megalopa, " .. ..	..	..	..	..	..	..	..	+
118	Caridid larvae, .. ..	..	..	..	..	+	..	..	..
119	Homarus vulgaris, M.-Edw. larva,	..	..	..	(2) 11	..	..	..	..
	MOLLUSCA.								
120	Lamellibranchiate larvae, ..	..	..	+	+	..	..	+	+
121	Gastropod larvae, .. ..	..	..	..	..	+	..	+	+
	TENUSCATA.								
122	Fritillaria borealis, Q. & G., ..	..	..	..	..	..	..	11	..
123	Oikopleura dioica, Fol., .. ..	..	..	..	..	..	..	+	..
	VERTEBRATA.								
124	Teleostei, ova et larvae, .. ..	..	..	+	..	..	..	+	..

* Both samples totally macerated.

IRISH LIGHT STATIONS, 1904—continued.

Lat. 52° 2' N., Long. 6° 40' W. 29 Fathoms.

October.		November.		December.		Species No.
9. 2.23 a.m.	25. 3.54 a.m.	5. 2.39 a.m.	23. 2.28 a.m.	7. 2.22 a.m.	23. 2.49 a.m.	
24	25	26	27	28	29	
f	..	..	..	f	..	CRUSTACEA (CETERA)—con.
..	..	..	..	..	..	Cirripedia larvae.
..	..	..	..	f	..	Cypris stage larvae.
+	+	f	f	f	..	Macroniscus.
f	..	f	..	..	..	Nauplius and Metanauplius.
f	..	..	..	..	..	Zoea.
f	..	..	..	..	..	Megalopa.
+	0	f	f	f	+	Candid larvae.
..	..	..	..	..	..	Homarus vulgaris, M.-Edw. larva.
f	f	f	f	f	+	MOLLUSCA.
f	f	f	f	f	+	Lamellibranchiate larvae.
..	..	..	..	..	..	TUNICATA.
..	f	f	f	..	..	Fritillaria borealis, Q. & G.
st	..	..	..	..	..	Oikopleura dioica, Fol.
						VERTEBRATA.
						Teleostei, ova et larvae.

FASTNET ROCK LIGHTHOUSE.

Species No.		February.		March.		April.		May.		June.	
		3- 3.30 p.m.	18. 3.30 p.m.	2. 1.0 p.m.	22. 4.30 p.m.	20. 6.0 p.m.	30. 12.30 p.m.	14. 12.30 p.m.	31. 3.0 p.m.	17. 3.15 p.m.	29. 12.10 p.m.
	DIATOMACEAE.	1	2	3	4	5	6	7	8	9	10
1	<i>Actinopteryx undulatus</i> , Ehb., ..	r	r	r	+	..	r	r	..	r	..
2	<i>Asterionella glacialis</i> , Castr., ..	..	..	..	..	..	..	..	+	..	..
3	<i>Biddulphia mobilis</i> , Bail., ..	c	+	+	+	..	r	..	..	r	..
4	<i>Chaetoceros borealis</i> , Bail., ..	..	..	..	..	..	..	..	..	..	..
5	— <i>constrictum</i> , Gran., ..	..	..	..	..	..	..	..	..	..	..
6	— <i>curvisetum</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
7	— <i>densum</i> , Cleve, ..	..	..	..	..	..	r	..	..	..	..
8	— <i>decipiens</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
9	— <i>densum</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
10	— <i>didymum</i> (Ehb.), Cleve, ..	..	..	..	..	..	..	..	..	..	..
11	— <i>laciniosum</i> , Schütt., ..	..	..	..	..	..	..	..	..	..	..
12	— <i>peruvianum</i> , Btw., ..	..	..	..	..	..	frag- ments it	..	..	..	..
13	— <i>sclopetaria</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
14	<i>Coscinodiscus concinnus</i> , W. Sm., ..	r	r	..	..	..	..	..	..	..	..
15	— <i>excentricus</i> , Ehb., ..	r	r	r	r	..	..	..	r	+	r
16	— <i>oculus iridis</i> , Ehb., ..	r	+	+	..	..	..	..	..	..	..
17	— <i>radiatus</i> , Ehb., ..	r	r	r	+	..	r	..	r	r	r
18	<i>Dotyllum Brightwelli</i> , West., ..	..	..	..	..	..	r	..	..	..	..
19	<i>Fragilaria</i> , c.f. <i>oceanica</i> , Gran., ..	..	..	..	..	..	..	..	r	..	it
20	<i>Gomardella fasciata</i> , Pér., ..	..	..	..	..	..	..	..	..	..	..
21	<i>Hyalodiscus stelliger</i> , Bail., ..	+	+	+	c	..	r	r	+	c	r
22	<i>Lauderia borealis</i> , Gran., ..	..	..	..	..	..	?	..	..	..	..
23	<i>Navicula membranacea</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
24	<i>Nitzschia seriata</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
25	<i>Paralia sulcata</i> , Cleve, ..	r	r	r	r	..	r	..	+	r	r
26	<i>Pleurosigma</i> sp., ..	+	..	..	..	..	it	..	r	r	it
27	<i>Rhizosolenia alata</i> , Btw., ..	..	..	..	..	..	..	..	..	..	..
28	— <i>semispina</i> , Heasen, ..	..	..	..	..	..	..	..	..	..	r
29	— <i>setigera</i> , Btw., ..	..	..	..	..	..	..	..	..	..	..
30	— <i>Shrubsolei</i> , Cleve, ..	..	..	..	..	..	..	r	..	..	..
31	— <i>Stelteri</i> , Pér., ..	..	..	..	..	..	..	..	..	..	..
32	<i>Skeletonema costatum</i> (Grev.), Cleve, ..	..	..	..	..	..	+	..	..	..	..
33	<i>Thalassiosira</i> (<i>condensata</i> , Cleve?), ..	..	..	..	..	..	..	..	+	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 51° 23' 18" N, Long. 9° 36' 25" W.

July.		August.		September.		October.		November.		Dec.	Species No.
17. 1.30 p.m.	29. 4.0 p.m.	12. 2.15 p.m.	26. 1.30 p.m.	9. 11.30 p.m.	24. 1.0 p.m.	10. 12.45 p.m.	25. 1.45 p.m.	8. 3.0 p.m.	24. 1.30 p.m.	24. 2.30 p.m.	
11	12	13	14	15	16	17	18	19	20	21	DIATOMACEAE.
..	+	+	<i>Actinopteryx undulatus</i> , Ehb.
..	..	60	..	..	..	..	..	..	..	..	<i>Asterionella glacialis</i> , Castr.
..	<i>Biddulphia mobilensis</i> , Bail.
..	+	+	<i>Chaetoceros boreale</i> , Bail.
..	..	+	+	— <i>constrictum</i> , Grun.
..	..	+	+	— <i>curvisetum</i> , Cleve.
..	— <i>danicum</i> , Cleve.
..	..	+	..	+	+	+	— <i>decipiens</i> , Cleve.
..	+	+	+	+	+	..	— <i>densum</i> , Cleve.
..	+	— <i>didymum</i> (Ehb.), Cleve.
..	— <i>laciniosum</i> , Schütt.
..	— <i>peruvianum</i> , Btw.
..	— <i>scotopendra</i> , Cleve.
..	<i>Cocconeis concinna</i> , W. Sm.
..	+	— <i>excentricus</i> , Ehb.
..	+	0	0	+	..	..	..	..	— <i>oculus lridis</i> , Ehb.
..	?	..	+	..	+	+	+	— <i>radiatus</i> , Ehb.
..	+	+	+	<i>Ditylum Brightwelli</i> , West.
..	<i>Fragillaria</i> , c.f. <i>oceanica</i> , Grun.
..	<i>Guinardia flaccida</i> , Pér.
..	+	+	+	+	+	+	+	+	+	+	<i>Hyalodiscus stelliger</i> , Bail.
..	<i>Lauderia borealis</i> , Grun.
..	+	<i>Navicula membranacea</i> , Cleve.
..	..	+	+	<i>Nitzschia seriata</i> , Cleve.
..	..	+	+	+	+	+	+	+	+	+	<i>Paralia sulcata</i> , Cleve.
..	..	+	+	..	+	<i>Pleurosigma</i> sp.
..	..	+	+	+	+	+	+	+	+	+	<i>Rhizosolenia alata</i> , Btw.
..	..	+	— <i>semipinna</i> , Hensen.
..	— <i>setigera</i> , Btw.
..	..	0	0	..	..	+	+	..	..	..	— <i>Shrubsolei</i> , Cleve.
..	+	— <i>Stolterfothi</i> , Pér.
..	..	+	+	<i>Skeletonema costatum</i> (Grev.), Cleve.
..	<i>Thalassiosira</i> (<i>condensata</i> , Cleve?).

FASTNET ROCK LIGHTHOUSE—continued.

Species No.		February.		March.		April.		May.		June.	
		3- 3-30 p.m.	16. 3-30 p.m.	2. 7-0 p.m.	22. 4-30 p.m.	30. 6-0 p.m.	30. 12-30 p.m.	14. 12-30 p.m.	31. 3-0 p.m.	17. 3-15 p.m.	29. 12-10 p.m.
	DIATOMACEAE—cont.										
34	<i>Thalassiosira gravida</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
35	— <i>Nordenskiöldi</i> , Cleve, ..	..	..	..	..	..	..	..	..	..	..
36	<i>Thalassiothrix curvata</i> , Grun., ..	..	..	F	..	..	..	..	..	..	..
37	— <i>Frausfeldi</i> , Grun., ..	..	..	F	F	..	F	F	F	..	..
	PERIDINIDAE.										
38	<i>Ceratium furca</i> , Clap. & Lachm., ..	..	..	..	..	..	..	..	..	..	..
39	— <i>furca</i> (Ebbg.), Duj., ..	..	..	..	F	..	..	..	..	..	..
40	— <i>horridum</i> (Cleve), Grun., ..	..	..	..	..	..	..	..	..	..	..
41	— <i>longipes</i> (Hall.), Cleve, ..	..	..	..	..	..	..	..	..	..	..
42	— <i>macroceras</i> , Ebbg., ..	..	..	..	..	..	..	..	..	..	..
43	— <i>tripos</i> , (O. F. Müll.), Vanhöffen, ..	..	..	F	..	..	..	..	..	..	..
44	<i>Diplopsalis lenticula</i> , Bergh., ..	..	..	..	..	..	..	..	..	..	..
45	<i>Glenodinium acuminatum</i> , Ebbg., ..	..	..	..	..	..	..	..	..	..	..
46	<i>Gonyaulax polygramma</i> , Stein., ..	..	..	..	..	..	..	..	..	..	..
47	<i>Peridinium conicum</i> , Grun., ..	..	..	..	..	..	..	..	+	..	..
48	— <i>depressum</i> , Hall., ..	..	..	..	..	..	..	..	F	+	F
49	— <i>oceanicum</i> (Vanhöffen), Jörg., ..	..	..	..	..	..	..	..	..	..	..
50	— <i>ovatum</i> (Pösch.), Schütt., ..	..	..	..	..	..	..	..	..	..	..
51	— <i>pallidum</i> , Ostent., ..	..	..	F	..	..	..	+	F	..	..
52	— <i>pentagonum</i> , Grun., ..	..	..	..	..	..	..	..	F	..	..
53	<i>Prorocentrum micans</i> , Ebbg., ..	..	..	..	..	..	..	..	..	..	..
	FLAGELLATAE.										
54	<i>Diatoceia pelliculosa</i> , Lev., ..	..	..	..	..	..	..	F	..	F	..
	PROTOCOCCIDAE.										
55	<i>Halosphaera viridis</i> , Schütt., ..	F	+	+	+	..	..	..	..	..	..
56	<i>Trochiscia Clevei</i> , Lemm., ..	..	..	..	..	..	..	F	F	..	..
	SILICOFLAGELLATAE.										
57	<i>Dictyocha fibula</i> , Ebbg., ..	..	..	..	..	..	..	..	..	..	..
58	<i>Distaplia speculum</i> (Ebbg.), Haeckel., ..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS 1904—continued.

Lat. 51° 23' 18" N., Long. 9° 36' 25" W.

July.		August		September.		October.		November.		Dec.	Species No.
12. 1.10 p.m.	29. 4.0 p.m.	12. 2.15 p.m.	26. 1.30 p.m.	9. 11.30 p.m.	24. 1.0 p.m.	10. 12.45 p.m.	25. 1.45 p.m.	8. 3.0 p.m.	24. 1.30 p.m.	26. 2.30 p.m.	
11	12	13	14	15	16	17	18	19	20	21	DIATOMACEAE—cont.
					f	tr	..	..	..	..
											PERIDINIDAE.
											FLAGELLATAE.
											PROTOCOCCIDAE.
											SILICOFAGELLATAE.

FASTNET ROCK LIGHTHOUSE—continued.

Species No.	—	February.		March.		April.		May.		June.	
		3. 3.30 p.m.	13. 3.30 p.m.	2. 1.0 p.m.	12. 4.30 p.m.	20. 6.0 p.m.	30. 12.30 p.m.	14. 12.30 p.m.	31. 3.0 p.m.	17. 3.15 p.m.	29. 12.30 p.m.
		1	2	3	4	5	6	7	8	9	10
	INCERTAE SEDIS.										
59	"Umrindete Cyste," Hensen, ..	+	+	+	+	..	..	..	..	..	..
	PROTOZOA.										
60	Amphorella subulata (Ebbg.), Dad., ..	..	..	..	..	..	..	..	..	..	..
61	Cyrtarocylis norvegica (Dad.), Jörgensen, ..	..	..	..	..	..	..	..	..	..	..
62	— serrata (Meb.), Brandt., ..	..	..	..	..	..	..	..	..	..	..
63	Ptychocylis ureula, Clap. & Lachn., ..	..	..	..	..	..	..	..	+	..	..
64	Tintinnopsis beroidea, Stein., ..	..	..	..	..	..	..	..	..	+	..
65	— campanula (Ebbg.), Dad., ..	..	..	..	..	..	..	..	..	..	..
66	Lithomelista sp., ..	..	..	..	..	..	..	..	..	..	..
67	Globigena bulboidea, d'Orb., ..	..	0	+	0	..	+	..	..	..	..
	COELENTERATA.										
68	Hydrocodon prolifera, Agassiz, ..	..	..	..	..	..	?	..	..	..	..
69	Lilia blondina, Forbes, ..	..	..	..	..	..	..	..	..	..	..
70	Podocoryne sp., ..	..	..	..	..	..	..	..	..	..	..
71	Sarsia granulifera, Forbes, ..	..	..	..	..	..	..	..	..	..	..
72	— sp., ..	..	..	..	..	..	..	..	..	..	..
73	Tiara pileata, Agassiz, ..	..	..	..	..	..	..	..	..	..	..
74	Obelia nigra, E. T. B., ..	..	..	..	..	..	..	..	..	..	..
75	— sp., ..	..	..	..	..	..	..	..	+	..	..
76	Phallidium cymbalodium, E. T. B., ..	..	..	..	..	..	..	..	+	..	..
77	— temporarium, E. T. B., ..	..	..	..	..	..	..	..	..	..	..
78	Willia stellata, Forbes, ..	..	..	..	..	..	..	..	..	..	..
79	Aplantha rosea, Forbes, ..	..	..	..	..	..	..	..	..	..	..
80	Cupulita Sarsi, Haeckel, ..	..	..	..	..	..	..	..	..	..	..
81	Muggiaea atlantica, Cunningham, ..	..	..	..	..	..	..	..	..	..	..
82	Beroe ovata, Bosc., ..	..	..	..	..	..	..	..	..	..	..
	ECHINODERMATA.										
83	Auricularia, ..	..	..	..	..	..	..	..	..	..	..
84	Eupimaria, ..	..	..	..	..	..	..	..	..	..	..
85	Echinoporeus, ..	..	..	..	..	..	..	..	..	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 51° 23' 18" N., Long. 9° 36' 25" W.

July.		August.		September.		October.		November.		Dec.	Species No.	
12. 1.30 p.m.	29. 4.0 p.m.	12. 2.15 p.m.	28. 1.30 p.m.	9. 11.30 p.m.	24. 1.0 p.m.	10. 12.45 p.m.	25. 1.45 p.m.	8. 3.0 p.m.	24. 1.30 p.m.	24. 2.30 p.m.		
11	12	13	14	15	16	17	18	19	20	21	INCERTAE SEDIS. "Unidentified Cysts," Hensen.	59
											PROTOZOA. <i>Amphorella subulata</i> (Ehbg.), Dad.	60
											<i>Cyttarocylis norvegica</i> (Dad), Jørgensen.	61
											— serrata (Meb.), Brandt.	62
											<i>Ptychocylis umula</i> , Clap. & Lachm.	63
											<i>Tintinnopsis borealis</i> , Stein.	64
											— campanula (Ehbg.), Dad.	65
											<i>Lithomelasma</i> sp.	66
											<i>Globigerina bulloides</i> , d'Orb.	67
											CORLENTHERATA. <i>Hybocodon proifer</i> , Agassiz.	68
											<i>Luzia blondina</i> , Forbes.	69
											<i>Podocoryne</i> sp.	70
											<i>Sarsia granulifera</i> , Forbes.	71
											— sp.	72
											<i>Tiara pileata</i> , Agassiz.	73
											<i>Ochetia nigra</i> , E. T. B.	74
											— sp.	75
											<i>Phialidium cymbalodium</i> , E. T. B.	76
											— temporarium, E. T. B.	77
											<i>Willia stellata</i> , Forbes.	78
											<i>Agiantha rosea</i> , Forbes.	79
											<i>Cupulita Sarsi</i> , Haeckel.	80
											<i>Muggiana atlantica</i> , Cunningham.	81
											<i>Feroc ovata</i> , Bosc.	82
											ECHINODERMATA. <i>Auricularia</i> .	83
											<i>Bipinnaria</i> .	84
											<i>Echinopluteus</i> .	85

FASTNET ROCK LIGHTHOUSE—continued.

Species No.		February.		March.		April.		May.		June.	
		3. 3-30 p.m.	18. 3-30 p.m.	2. 1-0 p.m.	22. 4-30 p.m.	20. 6-0 p.m.	30. 12-30 p.m.	14. 12-30 p.m.	31. 3-0 p.m.	17. 5-15 p.m.	29. 12-30 p.m.
	ECHINODERMATA—con.	1	a	3	4	5	b	7	8	9	10
86	Ophiopluteus, ..	..	..	..	..	..	..	..	..	..	..
87	Ophiurid juv., ..	..	..	..	..	..	..	..	..	..	..
88	Spatangopluteus, ..	..	..	..	..	..	..	..	..	..	..
	VERMES.										
89	Actinotrocha, ..	..	..	..	..	..	..	..	..	..	..
90	Antolytas prolifer (Müll.), ..	..	..	..	..	..	..	..	..	..	..
91	Poecilochaetus larvae, ..	..	..	..	..	..	..	..	..	..	..
92	Polychaeta larvae, ..	..	..	f	f	..	..	..	f	..	..
93	Sagitta bipunctata, Q. et G., ..	f	f	f	cc	..	f	f	..	..	+
94	Tomepteria heigolandica, Grsf., ..	f	f	..	..	..	..	..	..	..	..
95	Terechophora, ..	..	f	f	..	..	..	..	..	..	..
	BRACHIOPODA.										
96	Cyphostoma, ..	..	..	..	..	..	..	..	+	+	..
	Copepoda.										
97	Acartia Clausi (Giesbr.), ..	..	f	f	..	f	..	..	+	c	+
98	Alteutha bopyroides, Claus, ..	..	..	..	..	+	..	f	..	..	f
99	Anomaloeca Pattersoni, R. Temp., ..	..	..	..	..	..	..	..	..	..	..
100	Calanus finmarchicus, Genn., ..	..	c	c	c	cc	+	c	c	c	cc
101	Candacia pectinata, Brady, ..	..	..	..	..	..	..	..	..	..	..
102	Centropages hamatus, Lillj., ..	..	..	..	..	f	..	..	+	f	f
103	— typicus, Kröyer, ..	..	..	..	..	..	..	..	..	..	..
104	Corycaeus anglicus, Lubb., ..	..	ff	..	..	..	..	..	..	..	..
105	Dyspontos striatus, Thorell, ..	..	..	..	..	ff	..	..	..	..	..
106	Dialia pygmaea, Scott, ..	..	..	..	..	f	..	..	..	..	..
107	Euterpia acroformis, Dana, ..	..	..	..	..	f	..	..	..	..	..
108	Metridia lucens, Boeck, ..	..	c	c	c	cc	+	c	c	c	cc
109	Macrosetella atlantica, Brady, ..	..	..	..	..	..	..	..	..	f	..
110	Oithona similis, Claus, ..	..	f	f	f	f	..	..	..	f	f
111	Paracalanus parvus, Claus, ..	..	..	..	..	f	..	f	..	c	+
112	Pseudocalanus elongatus, Giesbr., ..	..	+	+	+	+	+	+	c	c	c
113	Scutellidium fasciatum, Boeck, ..	..	..	..	..	..	..	..	..	..	..
114	Temora longicornis, O. F. Müller, ..	..	..	..	..	..	..	c	f	..	..

IRISH LIGHT STATIONS, 1904—continued.

Lat. 51° 23' 18" N., Long. 9° 36' 25" W.

July.		August.		September.		October.		November.		Dec.	Species No.
12. p.m.	29. p.m.	12. p.m.	26. p.m.	9. p.m.	24. p.m.	10. p.m.	25. p.m.	8. p.m.	24. p.m.	24. p.m.	
11	12	13	14	15	16	17	18	19	20	21	
..	..	f	r	f	c	r	r	..	..	..	ECHINODERMATA—con.
..	..	..	..	f	r	..	..	..	..	..	Ophioplectes, 86
..	..	..	..	..	..	..	..	..	..	..	Ophiurid juv., 87
..	..	..	..	..	..	..	..	..	..	..	Spatangoplateus, 88
..	..	..	..	..	..	..	..	..	..	..	VERMES.
..	..	..	..	..	..	f	..	..	..	..	Actinotrocha, 89
..	..	..	..	..	..	..	..	r	r	..	Autolytus proder (Mull.), 90
..	..	f	r	..	..	..	..	..	..	..	Poecilochaetus larvae, 91
f	r	f	r	+	+	f	..	..	..	..	Polychaeta larvae, 92
+	+	+	+	cc	c	+	f	+	+	+	Sagitta bipunctata, Q. et G., 93
..	f	f	+	c	c	+	f	+	+	+	Tomopteris helgolandica, Greef, 94
..	..	..	..	..	..	..	..	..	..	..	Trochophora, 95
+	f	f	r	r	r	+	..	+	+	..	BRACHIOPODA.
..	..	..	..	..	..	..	..	..	..	..	Cyphocentrus, 96
+	c	+	+	+	+	+	f	..	..	..	COPEPODA.
..	..	..	f	f	ff	..	..	..	..	..	Acartia Claus (Giesbr.), 97
..	..	..	..	ff	..	..	..	..	..	..	Alteutha bopyroidea, Claus, 98
cc	cc	c	cc	cc	cc	c	c	cc	cc	c	Anomalocera Pattersoni, R. Temp., 99
..	..	..	c	c	c	f	..	..	..	..	Calanus finmarchicus, Gunn., 100
+	+	..	r	..	..	..	..	..	..	..	Candacia pectinata, Brady, 101
..	f	+	+	c	c	+	f	+	r	..	Centropages hamatus, Lillj., 102
..	..	..	..	..	f	..	..	r	r	..	— typicus, Krøyer, 103
..	..	..	..	..	..	..	..	..	..	..	Corycaeus anglicus, Lubb., 104
..	..	..	..	..	..	..	..	..	..	..	Dyspontius striatus, Thorell, 105
..	..	..	..	..	..	..	..	..	..	..	Dianus pygmaea, Scott, 106
+	c	+	+	+	c	+	+	c	cc	c	Eutetia acutifrons, Dana, 107
..	..	..	..	..	..	..	..	..	..	..	Metridia lucens, Boeck., 108
ff	f	+	+	+	+	+	+	+	r	..	Microsetella atlantica, Brady, 109
..	..	+	f	..	f	r	f	+	+	+	Oithona similis, Claus, 110
+	+	+	+	+	+	+	+	+	+	+	Paracalanus parvus, Claus, 111
..	..	..	..	cc	..	..	..	..	..	..	Pseudocalanus elongatus, Giesbr., 112
f	+	..	+	+	+	+	+	r	r	f	Scutellidium fasciatum, Boeck., 113
..	..	..	..	..	..	..	..	..	..	..	Temora longicornis, O. F. Müller, 114

FASTNET ROCK LIGHTHOUSE—continued.

Species No.		February.		March.		April.		May.		June.	
		3. 3.30 p.m.	18. 3.30 p.m.	2. 4.30 p.m.	22. 4.30 p.m.	30. 6.0 p.m.	30. 12.30 p.m.	14. 12.30 p.m.	31. 3.0 p.m.	17. 3.15 p.m.	29. 12.30 p.m.
—	CRUSTACEA (CETERA).	1	2	3	4	5	6	7	8	9	10
113	Eudae Nordmanni, Lovén, ..	..	..	..	..	..	..	..	..	..	..
116	Podon intermedius, Lillj., ..	..	..	..	..	..	..	..	..	..	..
117	Hyperiid, juv., ..	..	..	..	..	..	..	..	..	..	f
118	Nyctiphanes Couchi, Bell, ..	..	0	..	..	..	..	..	..	..	..
119	Nyctiphanes norvegica, Sars., ..	..	0	..	..	..	..	..	..	..	..
120	Cliripedia larvae, ..	ff	..	ff	0	..	+	f	..	..	..
121	Cypris stage larvae, ..	..	..	..	..	..	f	+	..	..	..
122	Microniscus, ..	..	..	..	..	..	..	..	..	..	..
123	Nauplius & Metanauplius, ..	f	f	f	f	..	c	+	..	..	..
124	Zoea, ..	..	f	..	..	..	+	+	+	..	..
125	Megalopa, ..	..	..	..	..	..	..	..	..	..	..
126	Caridid larvae, ..	..	..	..	..	..	..	..	..	..	..
127	Jaera nocturna, Scott, ..	..	..	..	..	..	..	..	..	..	..
	MOLUSCA.										
128	Clione (borealis, Brug.) ..	..	..	..	..	..	..	..	..	..	..
129	Gastropod larvae, ..	..	..	f	f	..	+	..	f	..	f
130	Lamellibranchiate larvae, ..	..	f	f	f	..	+	..	f	..	..
131	Cephalopod larvae, ..	..	..	..	f	..	..	..	..	..	..
	TUNICATA.										
132	Ascidian larvae, ..	..	..	..	..	..	..	..	..	..	..
133	Doliolum tritonis, Hardman, ..	..	..	..	..	..	..	..	..	..	..
134	Pratibacia borealis, Q. et G., ..	..	..	..	..	..	..	..	..	..	..
135	Onkopleura dioica, Pol, ..	..	..	..	..	..	+	+	+	..	..
	VERTEBRATA.										
136	Teleostei, ova & larvae, ..	..	..	ff	..	..	..	..	+	f	+

ISH LIGHT STATIONS, 1904—continued.

Lat. 51° 23' 18" N., Long. 9° 36' 25" W.

July.		August.		September.		October.		November.		Dec.	Species No.
10. p.m.	20. p.m.	12. p.m.	26. p.m.	9. p.m.	24. p.m.	10. p.m.	25. p.m.	8. p.m.	24. p.m.	24. p.m.	
10	12	13	14	15	16	17	18	19	20	21	
..	..	..	..	..	÷	÷	..	..	..	..	CRUSTACEA (CETERA).
..	+	+	+	÷	+	..	..	..	..	..	<i>Eudae Noefmanni</i> , Lovén.
..	+	..	..	..	..	..	..	..	..	..	<i>Podon intermedius</i> , Lillj.
..	..	..	..	..	..	..	..	..	..	..	<i>Hyperid</i> , juv.
..	..	..	..	..	..	..	..	..	..	..	<i>Nyctiphanes Couchi</i> , Bell.
..	..	..	..	..	..	..	..	..	..	..	<i>Nyctiphanes norvegica</i> , Sars.
+	+	+	+	+	+	..	..	..	..	..	<i>Carripedia</i> larvae.
+	..	..	..	..	..	..	..	..	..	..	Cypris stage larvae.
..	..	..	+	..	..	..	..	..	..	..	Macriscus.
..	+	+	+	+	+	+	+	+	+	+	Nauplius and Metanauplius.
+	+	+	+	+	+	..	..	..	..	..	Zoea.
..	..	..	+	+	+	..	..	..	..	..	Megalopa.
+	+	+	÷	..	..	+	..	+	+	..	Candid larvae.
..	..	..	+	..	..	..	..	..	..	..	<i>Jarea nocturna</i> , Scott.
..	..	..	..	..	..	..	..	..	..	..	MOLLUSCA.
..	..	+	+	..	..	..	..	..	..	..	<i>Clione borealis</i> , Brug.?
..	..	+	+	..	..	..	+	+	+	+	Gastropod larvae.
..	..	+	+	..	..	..	+	+	+	+	Lamellibranchiate larvae.
..	..	..	..	..	..	..	..	..	..	..	Cephalopod larvae.
..	..	..	..	+	..	..	..	..	..	..	TUNICATA.
..	..	..	..	+	..	..	..	..	..	..	Ascidian larvae.
..	..	..	..	..	+	..	..	..	..	..	<i>Doliolum intonsa</i> , Herdman.
..	..	..	+	..	+	+	..	..	..	..	<i>Frullaria borealis</i> , Q. et G.
..	+	+	+	+	+	..	..	+	+	..	<i>Onkopleura dioica</i> , Foll.
+	+	+	+	+	+	..	..	..	..	..	VERTEBRATA.
+	+	+	+	+	+	..	..	..	..	..	Teleostei, ova & larvae.

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904.

SKULMARTIN LIGHTSHIP.

Lat. 54° 32' N., Long. 5° 26' W. 20 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Jan. 21, ..	10 15 p.m.	7.6	..	Feb. 29, ..	5 50 p.m.	6.1	..
Jan. 22, ..	10 15 a.m.	..	33.89	March 1, ..	6 30 a.m.	6.3	..
Jan. 23, ..	10 30 a.m.	7.8	..	March 2, ..	7 30 p.m.	6.2	..
Jan. 23, ..	11 15 a.m.	7.8	..	March 2, ..	7 55 a.m.	6.6	..
Jan. 23, ..	11 45 p.m.	8.0	..	March 2, ..	8 30 p.m.	6.4	..
Jan. 24, ..	12 10 p.m.	7.8	..	March 3, ..	8 30 a.m.	..	34.18
Jan. 25, ..	12 30 p.m.	7.8	..	March 3, ..	9 0 a.m.	6.0	..
Jan. 26, ..	1 50 p.m.	7.6	33.91	March 3, ..	9 30 p.m.	6.4	..
Jan. 27, ..	2 30 p.m.	7.6	..	March 4, ..	9 45 a.m.	6.6	..
Jan. 28, ..	4 0 p.m.	7.0	..	March 4, ..	10 0 p.m.	6.4	..
Jan. 29, ..	5 0 p.m.	7.2	..	March 5, ..	10 15 a.m.	6.0	..
Jan. 30, ..	5 50 a.m.	7.8	..	March 5, ..	10 35 p.m.	0.2	..
Jan. 31, ..	6 23 p.m.	7.6	..	March 6, ..	11 5 a.m.	6.2	..
Jan. 31, ..	7 0 a.m.	7.4	..	March 6, ..	11 30 p.m.	6.0	..
Feb. 1, ..	7 15 p.m.	7.2	..	March 7, ..	11 50 a.m.	6.2	..
Feb. 2, ..	7 40 a.m.	7.2	..	March 8, ..	12 25 a.m.	0.4	..
Feb. 2, ..	8 0 a.m.	7.4	..	March 8, ..	1 0 p.m.	0.2	..
Feb. 3, ..	8 20 a.m.	7.0	34.00	March 9, ..	1 20 a.m.	6.2	..
Feb. 3, ..	9 10 p.m.	7.4	..	March 9, ..	1 45 p.m.	0.6	34.18
Feb. 4, ..	9 20 a.m.	7.6	..	March 10, ..	2 0 a.m.	6.4	..
Feb. 5, ..	9 50 a.m.	7.4	..	March 10, ..	2 25 p.m.	6.6	..
Feb. 6, ..	10 45 a.m.	7.4	..	March 11, ..	3 0 a.m.	6.4	..
Feb. 7, ..	11 35 a.m.	7.6	..	March 11, ..	3 30 p.m.	6.6	..
Feb. 8, ..	1 0 p.m.	7.4	..	March 12, ..	4 20 a.m.	0.4	..
Feb. 9, ..	1 50 p.m.	7.6	..	March 12, ..	5 0 p.m.	6.8	..
Feb. 10, ..	2 30 a.m.	7.4	34.04	March 13, ..	5 30 a.m.	6.8	..
Feb. 10, ..	3 20 p.m.	7.4	..	March 13, ..	6 0 p.m.	6.8	..
Feb. 11, ..	3 50 a.m.	7.2	..	March 14, ..	6 30 a.m.	6.8	..
Feb. 11, ..	4 30 p.m.	7.4	..	March 14, ..	7 0 p.m.	6.6	..
Feb. 12, ..	5 10 a.m.	7.2	..	March 15, ..	7 20 a.m.	6.4	..
Feb. 12, ..	5 30 p.m.	7.2	..	March 15, ..	7 45 p.m.	6.6	..
Feb. 13, ..	6 0 a.m.	7.2	..	March 16, ..	7 55 a.m.	6.0	..
Feb. 13, ..	6 20 p.m.	7.4	..	March 16, ..	8 15 p.m.	6.6	..
Feb. 14, ..	7 0 p.m.	7.2	..	March 17, ..	8 35 a.m.	6.6	34.09
Feb. 15, ..	7 15 a.m.	7.2	..	March 17, ..	9 0 p.m.	6.8	34.11
Feb. 16, ..	8 15 a.m.	6.7	..	March 18, ..	9 10 a.m.	6.6	..
Feb. 16, ..	8 30 a.m.	..	34.11	March 18, ..	9 20 p.m.	6.0	..
Feb. 17, ..	8 25 a.m.	7.0	..	March 19, ..	9 7 a.m.	6.4	..
Feb. 18, ..	8 45 a.m.	6.7	..	March 19, ..	9 25 p.m.	6.8	..
Feb. 19, ..	9 10 a.m.	6.7	..	March 20, ..	9 40 a.m.	7.0	..
Feb. 20, ..	9 40 a.m.	6.7	..	March 20, ..	10 0 p.m.	7.0	..
Feb. 21, ..	10 20 a.m.	7.1	..	March 21, ..	10 15 a.m.	6.8	..
Feb. 22, ..	10 50 a.m.	6.9	..	March 21, ..	10 30 p.m.	0.8	..
Feb. 23, ..	11 45 a.m.	6.9	..	March 22, ..	11 0 a.m.	7.0	..
Feb. 24, ..	1 30 p.m.	6.7	..	March 22, ..	11 10 p.m.	7.0	..
Feb. 25, ..	1 50 p.m.	6.9	34.11	March 23, ..	11 30 a.m.	7.0	..
Feb. 26, ..	2 45 p.m.	6.7	..	March 23, ..	11 45 p.m.	7.2	..
Feb. 27, ..	4 15 p.m.	6.9	..	March 24, ..	12 15 p.m.	7.2	34.12
Feb. 28, ..	5 20 p.m.	6.5	..	March 25, ..	1 0 a.m.	7.0	..
Feb. 29, ..	5 40 a.m.	6.5	..	March 25, ..	1 30 p.m.	7.0	..

* The samples of water were titrated at the M. B. A. Laboratory, Plymouth,
by Mr. D. J. MATTHEWS.

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SKULMARTIN LIGHTSHIP.

Lat. 54° 32' N., Long. 5° 26' W. 20 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
March 26, ..	2 10 a.m.	7.0	..	May 1, ..	8 40 p.m.	7.2	..
" ..	2 45 p.m.	7.0	..	May 2, ..	8 50 a.m.	7.2	..
March 27, ..	3 30 a.m.	7.0	..	" ..	9 20 p.m.	7.2	..
" ..	4 0 p.m.	7.0	..	May 3, ..	9 50 a.m.	7.6	..
March 28, ..	4 45 a.m.	7.0	..	" ..	10 15 p.m.	7.4	..
" ..	5 15 p.m.	7.0	..	May 4, ..	10 35 a.m.	7.6	..
March 29, ..	6 0 a.m.	7.0	..	" ..	10 55 p.m.	7.4	..
" ..	6 30 p.m.	6.8	..	May 5, ..	11 20 a.m.	7.6	..
March 30, ..	7 0 a.m.	6.8	..	" ..	11 45 p.m.	7.4	..
" ..	7 20 p.m.	6.8	..	May 6, ..	Midday.	7.6	..
March 31, ..	7 45 a.m.	6.8	34.10	May 7, ..	12 45 a.m.	7.4	..
" ..	8 0 p.m.	6.8	..	" ..	1 15 p.m.	7.6	34.22
April 1, ..	8 20 a.m.	7.0	..	May 8, ..	2 0 a.m.	7.6	..
April 2, ..	8 45 a.m.	6.8	..	" ..	2 30 p.m.	7.6	..
April 3, ..	9 10 a.m.	6.6	..	May 9, ..	3 10 a.m.	7.6	..
" ..	9 30 p.m.	6.6	..	" ..	3 45 p.m.	7.8	..
April 4, ..	9 50 a.m.	6.6	..	May 10, ..	4 20 a.m.	8.0	..
April 5, ..	10 30 a.m.	6.6	..	" ..	4 47 p.m.	8.0	..
April 6, ..	11 10 a.m.	0.8	..	May 11, ..	5 16 a.m.	8.2	..
April 7, ..	12 15 p.m.	0.8	..	" ..	5 40 p.m.	8.0	..
April 8, ..	1 10 a.m.	7.0	..	May 12, ..	6 2 a.m.	7.8	..
" ..	1 50 p.m.	7.2	34.09	" ..	6 23 p.m.	8.0	..
April 9, ..	2 30 a.m.	6.8	..	May 13, ..	6 43 a.m.	8.0	..
" ..	3 10 p.m.	6.6	..	" ..	7 3 p.m.	8.0	..
April 10, ..	4 20 p.m.	7.0	..	May 14, ..	7 21 a.m.	8.0	..
April 11, ..	5 0 a.m.	6.8	..	" ..	7 35 p.m.	8.0	..
" ..	5 20 p.m.	7.0	..	May 15, ..	7 53 a.m.	8.0	..
April 12, ..	5 40 a.m.	7.0	..	" ..	8 11 p.m.	8.0	..
" ..	6 0 p.m.	7.2	..	May 16, ..	8 30 a.m.	8.2	34.22
April 13, ..	6 15 a.m.	6.8	..	" ..	8 49 p.m.	8.2	..
" ..	6 35 p.m.	6.8	..	May 17, ..	9 0 a.m.	8.2	..
April 14, ..	6 50 p.m.	6.8	..	" ..	9 15 p.m.	8.0	..
April 15, ..	7 10 a.m.	7.0	..	May 18, ..	9 32 a.m.	8.2	..
" ..	7 20 p.m.	7.4	34.11	" ..	9 54 p.m.	8.0	..
April 16, ..	7 40 a.m.	7.0	..	May 19, ..	10 15 a.m.	8.2	..
" ..	8 0 p.m.	7.2	..	" ..	10 39 p.m.	8.2	..
April 17, ..	8 30 a.m.	7.2	..	May 20, ..	11 4 a.m.	8.2	..
April 18, ..	9 0 a.m.	7.4	..	" ..	11 31 p.m.	8.0	..
" ..	9 15 p.m.	7.2	..	May 21, ..	11 55 a.m.	8.2	..
April 19, ..	9 25 a.m.	7.2	..	" ..	Midnight.	8.2	..
" ..	9 35 p.m.	7.2	..	May 22, ..	12 58 a.m.	8.0	..
April 20, ..	10 30 a.m.	7.4	..	" ..	1 36 p.m.	8.2	..
April 21, ..	11 20 a.m.	7.4	..	May 23, ..	2 13 a.m.	8.2	..
April 22, ..	Midday.	7.4	..	" ..	2 48 p.m.	8.4	34.14
April 23, ..	1 20 p.m.	7.2	34.04	May 24, ..	3 18 a.m.	8.2	..
April 24, ..	2 40 p.m.	7.2	..	" ..	3 48 p.m.	8.4	..
April 25, ..	3 10 a.m.	7.0	..	May 25, ..	4 21 a.m.	8.4	..
" ..	3 40 p.m.	7.2	..	" ..	4 54 p.m.	8.6	..
April 26, ..	5 0 p.m.	7.4	..	May 26, ..	5 26 a.m.	8.4	..
April 27, ..	5 25 a.m.	7.2	..	" ..	5 54 p.m.	8.6	..
" ..	5 45 p.m.	7.4	..	May 27, ..	6 18 a.m.	8.6	..
April 28, ..	6 30 p.m.	7.4	..	" ..	6 46 p.m.	8.0	..
April 29, ..	7 0 a.m.	7.6	..	May 28, ..	7 8 a.m.	8.6	..
" ..	7 20 p.m.	7.6	..	" ..	7 30 p.m.	8.8	..
April 30, ..	7 40 a.m.	7.4	34.13	May 29, ..	7 52 a.m.	8.8	..
" ..	8 10 p.m.	7.4	..	" ..	8 12 p.m.	8.8	..
May 1, ..	8 30 a.m.	7.4	..	May 30, ..	8 33 a.m.	8.8	34.16

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SKULMARTIN LIGHTSHIP.

Lat. 54° 32' N., Long. 5° 26' W. 20 fathoms.

Date.	Hour	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
May 30, ..	8 53 p.m.	8.8	..	July 1, ..	9 30 a.m.	10.6	..
May 31, ..	9 6 a.m.	8.8	..	" ..	10 0 p.m.	10.6	..
" ..	9 16 p.m.	8.8	..	July 2, ..	10 0 a.m.	10.8	..
June 1, ..	9 36 a.m.	9.0	..	" ..	10 29 p.m.	10.6	..
" ..	9 53 p.m.	9.0	..	July 3, ..	10 49 a.m.	10.8	..
June 2, ..	10 15 a.m.	9.2	..	" ..	11 10 p.m.	10.6	..
" ..	10 35 p.m.	9.2	..	July 4, ..	11 30 a.m.	10.8	..
June 3, ..	11 0 a.m.	9.4	..	" ..	11 55 p.m.	10.8	..
" ..	11 18 p.m.	9.2	..	July 5, ..	12 30 p.m.	11.2	33.28
June 4, ..	11 40 a.m.	9.8	..	July 6, ..	1 7 a.m.	11.0	..
" ..	Midnight.	9.6	..	" ..	1 35 p.m.	11.0	..
June 5, ..	12 25 p.m.	9.8	..	July 7, ..	2 4 a.m.	11.8	..
June 6, ..	1 5 a.m.	9.4	..	" ..	2 37 p.m.	11.2	..
" ..	1 30 p.m.	9.8	..	July 8, ..	3 3 a.m.	11.0	..
June 7, ..	2 0 a.m.	9.2	..	" ..	3 38 p.m.	11.2	..
" ..	2 35 p.m.	10.0	33.26	July 9, ..	4 9 a.m.	11.0	..
June 8, ..	3 5 a.m.	9.4	..	" ..	4 40 p.m.	11.2	..
" ..	3 35 p.m.	9.8	..	July 10, ..	5 6 a.m.	11.6	..
June 9, ..	4 0 a.m.	9.2	..	" ..	5 32 p.m.	12.0	..
" ..	4 30 p.m.	9.6	..	July 11, ..	5 56 a.m.	11.2	..
June 10, ..	5 0 a.m.	9.0	..	" ..	6 21 p.m.	11.0	..
" ..	5 20 p.m.	10.0	..	July 12, ..	6 43 a.m.	11.2	..
June 11, ..	5 45 a.m.	9.4	..	" ..	7 0 p.m.	11.2	..
" ..	6 5 p.m.	10.0	..	July 13, ..	7 29 a.m.	11.2	..
June 12, ..	6 25 a.m.	9.8	..	" ..	7 55 p.m.	11.4	..
" ..	6 50 p.m.	10.0	..	July 14, ..	8 16 a.m.	11.4	..
June 13, ..	7 5 a.m.	10.0	..	" ..	8 39 p.m.	11.6	..
" ..	7 25 p.m.	10.2	..	July 15, ..	9 0 a.m.	11.6	..
June 14, ..	7 45 a.m.	10.0	..	" ..	9 5 p.m.	11.8	..
June 15, ..	8 30 a.m.	9.8	33.24	July 16, ..	9 27 a.m.	11.8	..
" ..	8 50 p.m.	10.2	..	" ..	9 54 p.m.	11.2	..
June 16, ..	9 15 a.m.	9.6	..	July 17, ..	10 20 a.m.	11.6	..
" ..	9 40 p.m.	9.4	..	" ..	10 46 p.m.	11.0	..
June 17, ..	10 0 a.m.	10.0	..	July 18, ..	11 13 a.m.	11.6	..
" ..	10 30 p.m.	10.0	..	" ..	11 41 p.m.	11.4	..
June 18, ..	11 10 a.m.	9.8	..	July 19, ..	12 36 p.m.	11.6	..
June 19, ..	Midday.	10.0	..	July 20, ..	1 6 a.m.	11.4	..
June 20, ..	12 30 a.m.	10.0	..	" ..	1 36 p.m.	11.6	..
" ..	1 0 p.m.	9.8	..	July 21, ..	2 9 a.m.	11.4	..
June 21, ..	1 30 a.m.	9.8	..	" ..	2 42 p.m.	11.8	..
" ..	2 10 p.m.	10.0	..	July 22, ..	3 15 a.m.	11.6	..
June 22, ..	3 10 p.m.	10.0	33.31	" ..	3 48 p.m.	12.0	..
June 23, ..	3 45 a.m.	9.6	..	July 23, ..	4 24 a.m.	11.6	34.14
" ..	4 15 p.m.	10.0	..	" ..	4 54 p.m.	11.8	..
June 24, ..	4 50 a.m.	9.8	..	July 24, ..	5 25 a.m.	11.6	..
" ..	5 15 p.m.	9.8	..	" ..	5 52 p.m.	11.8	..
June 25, ..	5 40 a.m.	9.8	..	July 25, ..	6 16 a.m.	11.6	..
" ..	6 5 p.m.	10.0	..	" ..	6 36 p.m.	12.0	..
June 26, ..	7 0 p.m.	10.0	..	July 26, ..	7 0 a.m.	12.0	..
June 27, ..	7 15 a.m.	10.0	..	" ..	7 20 p.m.	11.8	..
" ..	7 35 p.m.	10.2	..	July 27, ..	7 40 a.m.	11.8	..
June 28, ..	7 50 a.m.	10.0	33.53	" ..	7 58 p.m.	12.0	..
" ..	8 15 p.m.	10.0	..	July 28, ..	8 15 a.m.	12.0	34.14
June 29, ..	8 30 a.m.	10.2	..	" ..	8 32 p.m.	12.0	..
" ..	8 50 p.m.	10.2	..	July 29, ..	8 48 a.m.	12.0	..
June 30, ..	9 0 a.m.	10.6	..	" ..	9 0 p.m.	12.0	..
" ..	9 10 p.m.	10.6	..	July 30, ..	9 5 a.m.	12.4	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SKULMARTIN LIGHTSHIP. Lat 54° 32' N., Long. 5° 26' W. 20 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
July 30, ..	9 23 p.m.	12.0	..	August 30, ..	10 0 a.m.	13.2	..
July 31, ..	9 41 a.m.	12.2	..	" ..	10 17 p.m.	13.0	..
" ..	9 58 p.m.	12.0	..	August 31, ..	10 37 a.m.	13.0	..
August 1, ..	10 15 a.m.	12.4	..	" ..	10 55 p.m.	12.8	..
" ..	10 34 p.m.	12.2	..	Sept. 1, ..	11 19 a.m.	13.0	..
August 2, ..	10 53 a.m.	12.6	..	" ..	11 41 p.m.	13.0	..
" ..	11 13 p.m.	12.4	..	Sept. 2, ..	Midday.	13.2	..
August 3, ..	11 36 a.m.	12.6	..	Sept. 3, ..	12 32 a.m.	13.0	..
" ..	11 59 p.m.	12.2	..	" ..	1 2 p.m.	12.8	..
August 4, ..	12 20 a.m.	12.2	..	Sept. 4, ..	1 37 a.m.	12.8	..
" ..	12 45 p.m.	12.6	..	" ..	2 14 p.m.	13.0	..
August 5, ..	1 15 a.m.	12.4	..	Sept. 5, ..	2 52 a.m.	13.0	34.02
" ..	1 45 p.m.	12.6	..	" ..	3 32 p.m.	13.2	..
August 6, ..	2 16 a.m.	12.2	..	Sept. 6, ..	4 11 a.m.	13.0	..
" ..	2 50 p.m.	12.4	34.14	" ..	4 46 p.m.	13.2	..
August 7, ..	3 25 a.m.	12.2	..	Sept. 7, ..	5 17 a.m.	13.0	..
" ..	4 0 p.m.	12.6	..	" ..	5 44 p.m.	13.0	..
August 8, ..	4 37 a.m.	12.4	..	Sept. 8, ..	6 8 a.m.	12.8	..
" ..	5 10 p.m.	12.6	..	" ..	6 32 p.m.	13.0	..
August 9, ..	5 36 a.m.	12.4	..	Sept. 9, ..	6 55 a.m.	12.8	..
" ..	6 0 p.m.	12.6	..	" ..	7 17 p.m.	13.0	..
August 10, ..	6 25 a.m.	12.4	..	Sept. 10, ..	7 42 a.m.	12.8	..
" ..	6 50 p.m.	12.6	..	" ..	8 4 p.m.	13.0	..
August 11, ..	7 15 a.m.	12.2	..	Sept. 11, ..	8 26 a.m.	13.0	..
" ..	7 38 p.m.	12.4	..	" ..	8 47 p.m.	12.8	..
August 12, ..	8 0 a.m.	12.4	34.11	Sept. 12, ..	9 0 a.m.	12.8	34.14
" ..	8 25 p.m.	12.2	..	" ..	9 11 p.m.	12.8	..
August 13, ..	8 47 a.m.	12.6	..	Sept. 13, ..	9 36 a.m.	13.0	..
" ..	9 0 p.m.	12.4	..	" ..	9 58 p.m.	12.8	..
August 14, ..	9 35 p.m.	12.4	..	Sept. 14, ..	10 20 a.m.	13.0	..
August 15, ..	10 23 a.m.	12.4	..	" ..	10 46 p.m.	13.0	..
" ..	10 49 p.m.	12.4	..	Sept. 15, ..	11 11 a.m.	13.0	..
August 16, ..	11 15 a.m.	12.6	..	" ..	11 37 p.m.	12.8	..
" ..	11 42 p.m.	12.6	..	Sept. 16, ..	Midday.	13.0	..
August 17, ..	12 10 a.m.	12.4	..	Sept. 17, ..	1 5 a.m.	12.8	..
" ..	12 35 p.m.	12.0	..	" ..	1 39 p.m.	13.0	..
August 18, ..	1 5 p.m.	12.6	..	Sept. 18, ..	2 17 a.m.	13.0	..
August 19, ..	1 36 a.m.	12.4	..	" ..	2 55 p.m.	13.2	..
" ..	2 10 p.m.	12.6	34.07	Sept. 19, ..	3 36 a.m.	13.0	34.18
August 20, ..	2 45 a.m.	12.4	..	" ..	4 17 p.m.	13.2	..
" ..	3 30 p.m.	12.6	..	Sept. 20, ..	4 48 a.m.	13.0	..
August 21, ..	4 0 a.m.	12.4	..	" ..	5 17 p.m.	13.2	..
" ..	4 35 p.m.	12.6	..	Sept. 21, ..	5 42 a.m.	13.0	..
August 22, ..	5 15 a.m.	12.2	..	" ..	6 2 p.m.	13.0	..
" ..	5 40 p.m.	12.4	..	Sept. 22, ..	6 22 a.m.	13.0	..
August 23, ..	6 30 p.m.	12.8	..	" ..	6 39 p.m.	13.2	..
August 24, ..	6 45 a.m.	12.4	..	Sept. 23, ..	6 56 a.m.	13.2	..
" ..	7 5 p.m.	12.8	..	" ..	7 12 p.m.	13.2	..
August 25, ..	7 20 a.m.	12.6	..	Sept. 24, ..	7 27 a.m.	13.0	..
" ..	7 40 p.m.	12.8	..	" ..	7 42 p.m.	12.6	..
August 26, ..	8 0 a.m.	12.6	..	Sept. 25, ..	7 58 a.m.	13.0	..
" ..	8 12 p.m.	12.8	..	" ..	8 11 p.m.	13.0	..
August 27, ..	8 25 a.m.	12.8	34.20	Sept. 26, ..	8 26 a.m.	12.8	34.14
" ..	8 40 p.m.	12.8	..	" ..	8 41 p.m.	13.0	..
August 28, ..	8 55 a.m.	13.0	..	Sept. 27, ..	8 57 a.m.	13.2	..
August 29, ..	9 28 a.m.	13.0	..	" ..	9 0 p.m.	13.0	..
" ..	9 45 p.m.	13.0	..	Sept. 28, ..	9 14 a.m.	12.2	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SKULMARTIN LIGHTSHIP.

Lat. 54° 32' N, Long. 5° 26' W. 20 fathoms.

Date	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Sept. 28, ..	9 31 p.m.	13.0	..	Oct. 28, ..	10 8 p.m.	12.2	..
Sept. 29, ..	10 5 a.m.	13.2	..	Oct. 29, ..	10 25 a.m.	12.0	..
" ..	10 25 p.m.	13.0	..	" ..	10 52 p.m.	11.8	..
Sept. 30, ..	10 46 a.m.	13.2	..	Oct. 30, ..	11 15 a.m.	12.2	..
" ..	11 10 p.m.	13.0	..	" ..	11 45 p.m.	12.2	..
Oct. 1, ..	11 37 a.m.	13.2	..	Oct. 31, ..	12 10 p.m.	12.4	..
" ..	Midnight.	13.2	..	Nov. 1, ..	12 51 a.m.	12.4	34.09
Oct. 2, ..	12 35 p.m.	13.0	..	" ..	1 30 p.m.	12.2	..
Oct. 3, ..	1 10 a.m.	13.0	..	Nov. 2, ..	2 11 a.m.	12.0	..
" ..	1 50 p.m.	13.2	..	" ..	2 48 p.m.	12.2	..
Oct. 4, ..	2 28 a.m.	13.0	..	Nov. 3, ..	3 26 a.m.	12.0	..
" ..	3 10 p.m.	13.0	34.87	" ..	4 1 p.m.	12.2	..
Oct. 5, ..	3 50 a.m.	12.8	..	Nov. 4, ..	4 33 a.m.	12.2	..
" ..	4 25 p.m.	12.8	..	" ..	5 2 p.m.	12.0	..
Oct. 6, ..	4 58 a.m.	12.0	..	Nov. 5, ..	5 27 a.m.	12.0	..
" ..	5 25 p.m.	11.8	..	" ..	5 52 p.m.	11.8	..
Oct. 7, ..	5 50 a.m.	11.4	..	Nov. 6, ..	6 15 a.m.	11.8	..
" ..	6 15 p.m.	11.6	..	" ..	6 39 p.m.	11.6	..
Oct. 8, ..	6 35 a.m.	11.6	..	Nov. 7, ..	7 0 a.m.	11.8	..
" ..	6 55 p.m.	11.4	..	" ..	7 23 p.m.	11.4	..
Oct. 9, ..	7 19 a.m.	11.8	..	Nov. 8, ..	7 44 a.m.	11.4	34.18
" ..	7 43 p.m.	12.0	..	" ..	8 5 p.m.	11.0	34.14
Oct. 10, ..	8 5 a.m.	12.4	34.16	Nov. 9, ..	8 26 a.m.	11.8	..
" ..	8 20 p.m.	12.6	..	" ..	8 47 p.m.	11.6	..
Oct. 11, ..	8 47 a.m.	12.6	..	Nov. 10, ..	9 9 a.m.	11.2	..
" ..	9 10 p.m.	12.6	..	" ..	9 31 p.m.	11.4	..
Oct. 12, ..	9 32 a.m.	12.4	..	Nov. 11, ..	9 54 a.m.	11.4	..
" ..	9 55 p.m.	12.4	..	" ..	10 19 p.m.	11.4	..
Oct. 13, ..	10 18 a.m.	12.0	..	Nov. 12, ..	10 44 a.m.	11.0	..
" ..	10 42 p.m.	12.4	..	" ..	11 7 p.m.	11.4	..
Oct. 14, ..	11 0 a.m.	12.4	..	Nov. 13, ..	11 33 a.m.	11.6	..
" ..	11 34 p.m.	12.4	..	" ..	Midnight.	11.4	..
Oct. 15, ..	Midday.	12.4	..	Nov. 14, ..	12 28 p.m.	11.4	..
Oct. 16, ..	12 32 a.m.	12.0	..	Nov. 15, ..	12 59 a.m.	11.4	..
" ..	1 5 p.m.	12.4	..	" ..	1 31 p.m.	11.0	..
Oct. 17, ..	1 40 a.m.	12.4	..	Nov. 16, ..	2 8 a.m.	11.4	34.13
" ..	2 20 p.m.	12.2	34.14	" ..	2 43 p.m.	11.6	..
Oct. 18, ..	2 58 a.m.	12.4	..	Nov. 17, ..	3 10 a.m.	11.4	..
" ..	3 35 p.m.	12.6	..	" ..	3 52 p.m.	11.0	..
Oct. 19, ..	4 10 a.m.	12.4	..	Nov. 18, ..	4 22 a.m.	11.6	..
" ..	4 40 p.m.	12.8	..	" ..	4 48 p.m.	11.8	..
Oct. 20, ..	5 10 a.m.	12.0	..	Nov. 19, ..	5 11 a.m.	11.6	..
" ..	5 30 p.m.	12.8	..	" ..	5 32 p.m.	11.0	..
Oct. 21, ..	5 50 a.m.	12.6	..	Nov. 20, ..	5 50 a.m.	11.0	..
" ..	6 10 p.m.	12.6	..	" ..	6 8 p.m.	10.4	..
Oct. 22, ..	6 26 a.m.	12.2	..	Nov. 21, ..	6 26 a.m.	10.6	..
" ..	6 45 p.m.	12.4	..	" ..	6 45 p.m.	10.4	..
Oct. 23, ..	6 57 a.m.	12.4	..	Nov. 22, ..	7 0 a.m.	10.4	..
" ..	7 12 p.m.	12.2	..	" ..	7 18 p.m.	10.0	..
Oct. 24, ..	7 30 a.m.	12.0	..	Nov. 23, ..	7 35 a.m.	10.2	..
" ..	7 45 p.m.	12.0	..	" ..	7 53 p.m.	10.4	..
Oct. 25, ..	8 0 a.m.	12.0	34.14	Nov. 24, ..	8 0 a.m.	10.0	34.27
" ..	8 15 p.m.	12.0	..	" ..	8 26 p.m.	10.2	..
Oct. 26, ..	8 45 a.m.	12.2	..	Nov. 25, ..	8 45 a.m.	10.0	..
Oct. 27, ..	9 5 a.m.	12.2	..	" ..	9 6 p.m.	10.2	..
" ..	9 20 p.m.	12.2	..	Nov. 26, ..	9 23 a.m.	10.0	..
Oct. 28, ..	9 45 a.m.	12.0	..	" ..	9 50 p.m.	10.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SKULMARTIN LIGHTSHIP. Lat. 54° 32' N., Long. 5° 26' W. 20 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Nov. 27, ..	10 14 a.m.	10.2	..	Dec. 15, ..	1 40 p.m.	9.4	..
" ..	10 40 p.m.	10.2	..	Dec. 16, ..	2 15 a.m.	9.4	..
Nov. 28, ..	11 7 a.m.	10.2	..	" ..	2 45 p.m.	9.2	34.42
" ..	11 36 p.m.	10.0	..	Dec. 17, ..	3 15 a.m.	9.2	..
Nov. 29, ..	Midday.	10.4	..	" ..	3 50 p.m.	9.2	..
Nov. 30, ..	12 38 a.m.	10.2	..	Dec. 18, ..	4 20 a.m.	9.4	..
" ..	1 13 p.m.	10.4	..	" ..	4 45 p.m.	9.4	..
Dec. 1, ..	1 50 a.m.	10.4	34.29	Dec. 19, ..	5 10 a.m.	9.2	..
" ..	2 26 p.m.	10.4	..	" ..	5 30 p.m.	9.4	..
Dec. 2, ..	2 58 a.m.	10.2	..	Dec. 20, ..	5 55 a.m.	9.2	..
" ..	3 33 p.m.	10.4	..	" ..	6 15 p.m.	9.0	..
Dec. 3, ..	4 8 a.m.	10.4	..	Dec. 21, ..	6 32 a.m.	9.4	..
" ..	4 38 p.m.	10.2	..	" ..	6 52 p.m.	9.2	..
Dec. 4, ..	5 5 a.m.	10.4	..	Dec. 22, ..	7 13 a.m.	9.2	..
" ..	5 30 p.m.	10.2	..	" ..	7 34 p.m.	9.2	..
Dec. 5, ..	5 55 a.m.	10.2	..	Dec. 23, ..	7 53 a.m.	9.4	34.27
" ..	6 20 p.m.	10.4	..	" ..	8 15 p.m.	9.0	..
Dec. 6, ..	6 45 a.m.	10.2	..	Dec. 24, ..	8 34 a.m.	9.2	..
" ..	7 5 p.m.	10.4	..	" ..	9 0 p.m.	9.2	..
Dec. 7, ..	7 25 a.m.	10.2	..	Dec. 25, ..	9 17 a.m.	9.2	..
" ..	7 50 p.m.	10.2	..	" ..	9 40 p.m.	9.2	..
Dec. 8, ..	8 12 a.m.	10.0	34.45	Dec. 26, ..	10 4 a.m.	8.8	..
" ..	8 30 p.m.	10.2	..	" ..	10 30 p.m.	9.0	..
Dec. 9, ..	8 52 a.m.	10.0	..	Dec. 27, ..	10 55 a.m.	9.2	..
" ..	9 5 p.m.	9.8	..	" ..	11 26 p.m.	9.0	..
Dec. 10, ..	9 30 a.m.	9.8	..	Dec. 28, ..	Midday.	9.2	..
" ..	9 56 p.m.	9.6	..	Dec. 29, ..	12 28 a.m.	9.0	..
Dec. 11, ..	10 15 a.m.	9.8	..	" ..	12 54 p.m.	9.4	34.36
Dec. 12, ..	11 5 a.m.	9.0	..	Dec. 30, ..	1 25 a.m.	9.0	..
Dec. 13, ..	Midday.	9.2	..	" ..	1 58 p.m.	9.0	..
Dec. 14, ..	12 45 p.m.	9.2	..	Dec. 31, ..	2 32 a.m.	9.0	..
Dec. 15, ..	1 15 a.m.	9.2	..	" ..	3 5 p.m.	9.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	S ₁₀₀₀	1904.		°C.	S ₁₀₀₀
Jan. 17, ..	7 10 p.m.	7.2	..	Feb. 2, ..	8 0 a.m.	7.1	..
" ..	7 25 p.m.	7.2	..	" ..	8 10 a.m.	7.1	..
" ..	7 35 p.m.	7.2	..	" ..	8 20 a.m.	7.2	..
" ..	7 40 p.m.	7.3	..	Feb. 3, ..	8 30 a.m.	7.2	..
" ..	7 55 p.m.	7.2	..	" ..	8 40 a.m.	7.1	..
" ..	8 5 p.m.	7.4	..	" ..	8 55 a.m.	7.1	..
Jan. 18, ..	7 35 a.m.	..	34.33	" ..	9 5 a.m.	7.1	..
" ..	7 0 p.m.	7.2	..	Feb. 4, ..	9 20 a.m.	7.3	..
" ..	7 6 p.m.	7.2	..	" ..	9 30 a.m.	7.2	..
" ..	7 11 p.m.	7.0	..	" ..	9 40 a.m.	7.2	..
" ..	7 18 p.m.	7.0	..	Feb. 5, ..	9 50 a.m.	7.2	..
" ..	7 25 p.m.	7.0	..	" ..	10 0 a.m.	7.2	..
Jan. 19, ..	8 0 p.m.	7.2	..	" ..	10 12 a.m.	7.1	..
" ..	8 10 p.m.	7.2	..	" ..	10 15 a.m.	7.1	..
Jan. 21, ..	9 0 a.m.	7.4	..	Feb. 6, ..	10 30 a.m.	7.2	..
" ..	9 10 a.m.	7.4	..	" ..	10 40 a.m.	7.2	..
" ..	9 20 a.m.	7.4	..	" ..	10 50 a.m.	7.1	..
Jan. 22, ..	9 50 a.m.	7.2	..	Feb. 7, ..	11 0 a.m.	7.3	..
" ..	10 0 a.m.	7.2	..	" ..	11 10 a.m.	7.2	..
" ..	10 15 a.m.	7.3	..	" ..	11 20 a.m.	7.2	..
" ..	10 25 a.m.	7.3	..	" ..	11 26 a.m.	7.2	..
Jan. 23, ..	10 40 a.m.	7.2	..	Feb. 8, ..	11 50 a.m.	7.2	..
" ..	10 55 a.m.	7.2	..	" ..	Midday.	7.1	..
" ..	11 10 a.m.	7.2	..	" ..	12 10 p.m.	7.1	..
Jan. 24, ..	11 30 a.m.	7.2	..	Feb. 9, ..	12 35 p.m.	7.0	..
" ..	11 40 a.m.	7.2	..	" ..	12 45 p.m.	7.0	..
" ..	11 55 a.m.	7.1	..	" ..	12 55 p.m.	7.1	34.42
" ..	Midday.	7.1	..	" ..	1 5 p.m.	7.1	..
Jan. 25, ..	11 45 a.m.	7.2	..	Feb. 10, ..	1 20 p.m.	7.0	..
" ..	Midday.	7.3	..	" ..	1 27 p.m.	7.1	..
" ..	12 15 p.m.	7.3	..	" ..	1 35 p.m.	7.1	..
Jan. 26, ..	Midday.	..	34.43	Feb. 11, ..	2 30 p.m.	7.2	..
" ..	12 20 p.m.	7.6	..	" ..	2 40 p.m.	7.3	..
" ..	12 30 p.m.	7.6	..	" ..	2 50 p.m.	7.3	..
" ..	12 38 p.m.	7.4	..	" ..	3 0 p.m.	7.3	..
" ..	12 45 p.m.	7.4	..	Feb. 12, ..	3 45 p.m.	7.2	..
Jan. 27, ..	1 20 p.m.	7.3	..	" ..	4 0 p.m.	7.1	..
" ..	1 30 p.m.	7.2	..	" ..	4 10 p.m.	7.1	..
" ..	1 50 p.m.	7.2	..	" ..	4 30 p.m.	7.1	..
" ..	2 0 p.m.	7.2	..	Feb. 13, ..	5 0 p.m.	7.3	..
Jan. 28, ..	2 40 p.m.	7.3	..	" ..	5 10 p.m.	7.3	..
" ..	2 55 p.m.	7.2	..	" ..	5 17 p.m.	7.3	..
" ..	3 0 p.m.	7.2	..	Feb. 14, ..	6 30 p.m.	7.1	..
Jan. 29, ..	3 40 p.m.	7.2	..	" ..	6 40 p.m.	7.1	..
" ..	4 0 p.m.	7.1	..	" ..	7 0 p.m.	7.0	..
" ..	4 15 p.m.	7.2	..	Feb. 15, ..	8 0 p.m.	7.0	..
Jan. 30, ..	5 0 p.m.	7.2	..	" ..	8 10 p.m.	7.0	..
" ..	5 10 p.m.	7.3	..	" ..	8 20 p.m.	7.9	..
" ..	5 20 p.m.	7.1	..	" ..	8 25 p.m.	7.9	..
" ..	5 30 p.m.	7.1	..	Feb. 16, ..	8 30 p.m.	7.0	..
Jan. 31, ..	5 45 p.m.	7.3	..	Feb. 17, ..	9 15 a.m.	6.4	34.52
" ..	6 0 p.m.	7.2	..	" ..	9 15 p.m.	6.6	..
" ..	6 10 p.m.	7.1	..	" ..	9 25 a.m.	6.6	..
" ..	6 20 p.m.	7.1	..	Feb. 18, ..	9 30 p.m.	6.6	..
Feb. 1, ..	7 0 a.m.	7.0	34.49	Feb. 19, ..	0 45 a.m.	6.8	..
" ..	7 10 a.m.	7.1	..	" ..	10 0 p.m.	7.0	..
" ..	7 25 a.m.	7.1	..	Feb. 20, ..	10 15 p.m.	7.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Feb. 21, ..	10 25 a.m.	7.0	..	March 16, ..	8 20 a.m.	6.4	..
" 22, ..	10 35 p.m.	7.0	..	" ..	8 30 a.m.	6.4	..
Feb. 22, ..	10 55 a.m.	6.8	..	" ..	8 38 a.m.	6.4	..
" ..	11 20 p.m.	6.8	..	March 17, ..	8 30 a.m.	6.3	..
Feb. 23, ..	11 45 a.m.	7.0	..	" ..	8 38 a.m.	6.4	..
Feb. 24, ..	12 5 a.m.	6.8	..	" ..	8 50 a.m.	6.4	..
" ..	12 41 p.m.	6.8	34.45	March 18, ..	9 0 a.m.	6.4	..
Feb. 25, ..	1 15 a.m.	6.4	..	" ..	9 10 a.m.	6.4	..
" ..	1 40 p.m.	6.8	..	" ..	9 19 a.m.	6.3	..
Feb. 26, ..	2 23 a.m.	6.8	..	" ..	9 28 a.m.	6.3	..
" ..	3 0 p.m.	6.6	..	" ..	9 0 p.m.	..	34.43
Feb. 27, ..	3 45 a.m.	6.2	..	March 19, ..	9 35 a.m.	6.4	..
" ..	4 24 p.m.	6.8	..	" ..	9 45 a.m.	6.5	..
Feb. 28, ..	5 2 a.m.	6.8	..	" ..	9 56 a.m.	6.5	..
" ..	5 34 p.m.	6.6	..	March 20, ..	9 50 a.m.	6.3	..
Feb. 29, ..	6 15 a.m.	5.8	..	" ..	9 58 a.m.	6.3	..
" ..	6 31 p.m.	6.2	..	" ..	10 10 a.m.	6.3	..
March 1, ..	6 50 a.m.	5.8	..	" ..	10 20 a.m.	6.3	..
" ..	7 10 p.m.	6.0	..	March 21, ..	10 30 a.m.	6.3	..
March 2, ..	7 38 a.m.	6.2	..	" ..	10 40 a.m.	6.4	..
" ..	8 0 p.m.	6.4	..	" ..	10 50 a.m.	6.4	..
March 3, ..	8 25 a.m.	6.0	34.49	March 22, ..	10 50 a.m.	6.4	..
" ..	8 30 p.m.	6.2	..	" ..	11 0 a.m.	6.4	..
March 4, ..	8 48 a.m.	6.4	..	" ..	11 10 a.m.	6.4	..
" ..	9 10 p.m.	6.4	..	" ..	11 20 a.m.	6.4	..
March 5, ..	9 32 a.m.	6.2	..	March 23, ..	11 50 a.m.	6.3	..
" ..	9 56 p.m.	6.2	..	" ..	Midday.	6.3	..
March 6, ..	10 17 a.m.	6.2	..	" ..	12 10 p.m.	6.4	..
" ..	10 38 p.m.	6.4	..	March 24, ..	12 35 p.m.	6.4	..
March 7, ..	10 59 a.m.	6.4	..	" ..	12 45 p.m.	6.4	..
" ..	11 21 p.m.	6.2	..	" ..	12 58 p.m.	6.3	..
March 8, ..	11 45 a.m.	6.4	..	" ..	1 10 p.m.	6.3	..
" ..	12 10 p.m.	6.4	..	March 25, ..	2 0 p.m.	6.5	..
March 9, ..	12 41 a.m.	6.4	..	" ..	2 10 p.m.	6.5	..
" ..	12 41 p.m.	..	34.47	" ..	2 22 p.m.	6.4	..
" ..	1 12 p.m.	6.0	..	March 26, ..	2 40 p.m.	6.3	..
March 10, ..	1 45 a.m.	6.6	..	" ..	2 50 p.m.	6.3	..
" ..	2 20 p.m.	6.4	..	" ..	2 58 p.m.	6.4	34.29
March 11, ..	3 0 a.m.	5.8	..	" ..	3 10 p.m.	6.4	..
" ..	4 30 p.m.	6.4	..	March 27, ..	3 20 p.m.	6.8	..
" ..	4 38 p.m.	6.4	..	" ..	3 30 p.m.	6.6	..
" ..	4 45 p.m.	6.3	..	" ..	3 40 p.m.	6.6	..
March 12, ..	5 15 p.m.	6.2	..	March 28, ..	4 10 p.m.	6.3	..
" ..	5 28 p.m.	6.3	..	" ..	4 20 p.m.	6.3	..
" ..	5 35 p.m.	6.3	..	" ..	4 30 p.m.	6.3	..
" ..	5 42 p.m.	6.3	..	" ..	4 42 p.m.	6.3	..
March 13, ..	6 30 p.m.	6.2	..	March 29, ..	5 20 p.m.	6.2	..
" ..	6 42 p.m.	6.2	..	" ..	5 30 p.m.	6.2	..
" ..	6 53 p.m.	6.3	..	" ..	5 40 p.m.	6.4	..
March 14, ..	7 15 p.m.	6.4	..	March 30, ..	6 10 p.m.	6.6	..
" ..	7 25 p.m.	6.4	..	" ..	6 20 p.m.	6.5	..
" ..	7 34 p.m.	6.4	..	" ..	6 30 p.m.	6.5	..
" ..	7 42 p.m.	6.4	..	" ..	6 40 p.m.	6.5	..
March 15, ..	7 50 a.m.	6.3	..	March 31, ..	6 30 p.m.	6.4	..
" ..	8 0 a.m.	6.3	..	" ..	6 45 p.m.	6.4	..
" ..	8 10 a.m.	6.3	..	" ..	7 0 p.m.	6.3	..
March 16, ..	8 10 a.m.	6.4	..	" ..	7 10 p.m.	6.3	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
April 1, ..	8 0 a.m.	6.6	..	April 21, ..	11 55 p.m.	7.4	..
" ..	8 10 a.m.	6.5	..	April 22, ..	11 30 a.m.	7.4	..
" ..	8 20 a.m.	6.5	..	" ..	11 30 p.m.	7.4	34.34
April 2, ..	8 40 a.m.	6.3	..	" ..	11 55 p.m.	7.4	..
" ..	8 50 a.m.	6.3	..	April 23, ..	12 38 a.m.	7.4	..
" ..	9 10 a.m.	6.4	34.33	" ..	1 15 p.m.	7.8	..
April 3, ..	9 30 a.m.	6.6	..	April 24, ..	1 53 a.m.	7.6	..
" ..	10 0 a.m.	6.5	..	" ..	2 32 p.m.	8.0	..
" ..	10 10 a.m.	6.5	..	April 25, ..	3 10 a.m.	7.4	..
" ..	10 20 a.m.	6.5	..	" ..	3 44 p.m.	7.4	..
April 4, ..	10 20 a.m.	6.3	..	April 26, ..	4 18 a.m.	7.6	..
" ..	10 30 a.m.	6.4	..	" ..	4 37 p.m.	7.8	..
" ..	10 40 a.m.	6.4	..	April 27, ..	5 18 a.m.	7.4	..
April 5, ..	11 0 a.m.	6.4	..	" ..	5 45 p.m.	7.6	..
" ..	11 10 a.m.	6.4	..	April 28, ..	6 10 a.m.	7.4	..
" ..	11 20 a.m.	6.5	..	" ..	6 34 p.m.	7.8	..
" ..	11 30 a.m.	6.5	..	April 29, ..	6 57 a.m.	7.8	34.33
April 6, ..	Midday.	6.2	..	" ..	7 17 p.m.	7.8	..
" ..	12 10 p.m.	6.3	..	April 30, ..	7 39 a.m.	8.0	..
" ..	12 25 p.m.	6.3	..	" ..	8 0 p.m.	8.0	..
April 7, ..	12 45 p.m.	6.4	..	May 1, ..	8 20 a.m.	8.0	..
" ..	12 58 p.m.	6.5	..	" ..	8 30 p.m.	8.0	..
" ..	1 10 p.m.	6.5	..	May 2, ..	8 43 a.m.	8.0	..
" ..	1 20 p.m.	6.5	..	" ..	9 4 p.m.	8.0	..
April 8, ..	1 30 p.m.	6.6	..	May 3, ..	9 24 a.m.	8.2	..
" ..	1 40 p.m.	6.6	..	" ..	9 47 p.m.	8.0	..
" ..	1 50 p.m.	6.6	..	May 4, ..	10 7 a.m.	8.4	..
April 9, ..	3 0 p.m.	6.4	..	" ..	10 28 p.m.	8.2	..
" ..	3 10 p.m.	6.4	..	May 5, ..	10 50 a.m.	8.0	..
" ..	3 25 p.m.	6.4	..	" ..	11 13 p.m.	8.0	..
April 10, ..	3 30 p.m.	6.6	..	May 6, ..	11 37 a.m.	8.2	..
" ..	3 40 p.m.	6.5	..	" ..	11 58 p.m.	8.0	..
" ..	3 50 p.m.	6.5	..	May 7, ..	12 31 a.m.	8.0	..
" ..	4 0 p.m.	6.5	..	" ..	1 4 p.m.	8.2	..
April 11, ..	4 20 a.m.	6.8	34.46	May 8, ..	1 37 a.m.	7.4	..
" ..	4 30 a.m.	6.7	..	" ..	2 4 p.m.	8.0	..
" ..	4 45 a.m.	6.7	..	May 9, ..	2 45 a.m.	8.0	..
" ..	5 0 p.m.	7.0	..	" ..	3 18 p.m.	9.6	..
April 12, ..	5 24 a.m.	7.0	..	May 10, ..	3 50 a.m.	8.2	..
" ..	5 55 p.m.	7.0	..	" ..	4 17 p.m.	9.0	..
April 13, ..	6 15 a.m.	6.2	..	May 11, ..	6 30 a.m.	6.0	..
" ..	6 30 p.m.	6.6	..	" ..	6 40 a.m.	6.5	..
April 14, ..	6 45 a.m.	6.2	..	" ..	6 50 a.m.	6.5	..
" ..	7 5 p.m.	6.6	..	May 12, ..	7 0 a.m.	7.0	..
April 15, ..	7 20 a.m.	6.4	..	" ..	7 10 a.m.	7.0	..
" ..	7 34 p.m.	7.0	..	" ..	7 20 a.m.	7.1	..
April 16, ..	7 50 a.m.	7.2	34.33	" ..	7 30 a.m.	7.1	..
" ..	8 10 p.m.	7.2	..	May 13, ..	7 30 a.m.	6.8	..
April 17, ..	8 24 a.m.	7.0	..	" ..	7 40 a.m.	6.7	..
" ..	8 30 p.m.	7.0	..	" ..	7 50 a.m.	6.7	..
April 18, ..	8 43 a.m.	7.2	..	" ..	8 0 a.m.	6.7	..
" ..	9 3 p.m.	7.2	..	May 14, ..	8 0 a.m.	7.9	..
April 19, ..	9 23 a.m.	7.2	..	" ..	8 10 a.m.	7.9	..
" ..	9 43 p.m.	7.2	..	" ..	8 20 a.m.	7.8	..
April 20, ..	10 0 a.m.	7.4	..	May 15, ..	8 30 a.m.	8.3	..
" ..	10 20 p.m.	7.2	..	" ..	3 40 a.m.	8.4	..
April 21, ..	10 40 a.m.	7.2	..	" ..	8 50 a.m.	8.4	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
May 16, ..	6 49 a.m.	8.6	34.34	June 8, ..	2 30 p.m.	9.6	..
" ..	8 59 a.m.	8.9	..	" ..	2 40 p.m.	9.6	..
" ..	9 0 a.m.	8.6	..	" ..	2 50 p.m.	9.8	34.33
" ..	9 10 a.m.	8.8	..	June 9, ..	3 40 p.m.	11.1	..
May 17, ..	9 0 a.m.	9.9	..	" ..	3 50 p.m.	11.2	..
" ..	9 10 a.m.	9.1	..	" ..	4 9 p.m.	11.2	..
" ..	9 29 a.m.	9.1	..	June 10, ..	5 0 p.m.	11.6	..
May 18, ..	9 20 a.m.	9.2	..	" ..	5 10 p.m.	11.5	..
" ..	9 39 a.m.	9.2	..	" ..	5 20 p.m.	11.5	..
" ..	9 40 a.m.	9.2	..	" ..	5 30 p.m.	11.5	..
" ..	9 50 a.m.	9.2	..	June 11, ..	6 10 p.m.	11.2	..
May 19, ..	10 0 a.m.	9.0	..	" ..	6 20 p.m.	11.1	..
" ..	10 10 a.m.	9.1	..	" ..	6 30 p.m.	11.1	..
" ..	10 20 a.m.	9.1	..	June 12, ..	6 40 p.m.	11.5	..
May 20, ..	11 0 p.m.	9.0	..	" ..	6 50 p.m.	11.4	..
May 21, ..	11 27 a.m.	8.6	..	" ..	7 0 p.m.	11.4	..
" ..	11 56 p.m.	8.6	..	" ..	7 10 p.m.	11.4	..
May 22, ..	12 26 a.m.	8.6	..	June 13, ..	7 20 a.m.	11.1	..
" ..	1 6 p.m.	9.0	34.33	" ..	7 30 a.m.	11.2	..
May 23, ..	1 43 a.m.	9.0	..	" ..	7 49 a.m.	11.2	..
" ..	2 18 p.m.	9.2	..	June 14, ..	7 50 a.m.	11.0	..
May 24, ..	2 48 a.m.	9.0	..	" ..	8 0 a.m.	10.9	34.29
" ..	3 18 p.m.	9.6	..	" ..	8 10 a.m.	11.0	..
May 25, ..	3 51 a.m.	9.2	..	" ..	8 20 a.m.	11.0	..
" ..	4 24 p.m.	9.6	..	June 15, ..	8 40 a.m.	11.5	..
May 26, ..	4 56 a.m.	9.2	..	" ..	8 50 a.m.	11.4	..
" ..	5 24 p.m.	9.4	..	" ..	9 0 a.m.	11.4	..
May 27, ..	5 46 a.m.	9.6	..	June 16, ..	9 0 a.m.	11.2	..
" ..	6 16 p.m.	9.6	..	" ..	9 10 a.m.	11.1	..
May 28, ..	6 36 a.m.	9.0	..	" ..	9 20 a.m.	11.1	..
" ..	7 0 p.m.	9.6	..	" ..	9 30 a.m.	11.1	..
May 29, ..	7 22 a.m.	9.0	..	June 17, ..	10 20 a.m.	10.8	..
" ..	7 42 p.m.	9.6	..	" ..	10 30 a.m.	10.7	..
May 30, ..	8 0 a.m.	9.6	..	" ..	10 40 a.m.	10.7	..
" ..	8 23 p.m.	9.6	..	June 18, ..	10 50 a.m.	11.2	..
May 31, ..	6 30 a.m.	9.6	..	" ..	11 0 a.m.	11.1	..
" ..	6 40 p.m.	9.8	..	" ..	11 10 a.m.	11.1	..
June 1, ..	9 6 a.m.	9.6	..	" ..	11 20 a.m.	11.1	..
" ..	9 4 p.m.	10.0	..	June 19, ..	11 40 a.m.	11.6	..
June 2, ..	9 45 a.m.	9.2	..	" ..	11 50 a.m.	11.7	..
June 3, ..	10 30 a.m.	10.3	..	" ..	Midday.	11.7	..
" ..	10 40 a.m.	10.2	..	June 20, ..	12 30 p.m.	11.8	..
" ..	10 50 a.m.	10.2	..	" ..	12 40 p.m.	11.7	..
June 4, ..	11 10 a.m.	11.2	..	" ..	12 50 p.m.	11.7	..
" ..	11 20 a.m.	11.1	..	" ..	1 0 p.m.	11.7	34.31
" ..	11 30 a.m.	11.1	..	June 21, ..	2 0 p.m.	11.8	..
June 5, ..	11 40 a.m.	11.3	..	" ..	2 10 p.m.	11.7	..
" ..	11 58 a.m.	11.3	..	" ..	2 20 p.m.	11.7	..
" ..	12 10 p.m.	11.3	..	June 22, ..	3 0 p.m.	11.9	..
June 6, ..	12 50 p.m.	11.0	..	" ..	3 10 p.m.	11.6	..
" ..	1 10 p.m.	11.1	..	" ..	3 20 p.m.	11.8	..
" ..	1 20 p.m.	11.1	..	" ..	3 30 p.m.	11.8	..
" ..	1 30 p.m.	11.1	..	June 23, ..	4 0 p.m.	12.7	..
June 7, ..	2 10 p.m.	10.6	..	" ..	4 10 p.m.	12.6	..
" ..	2 20 p.m.	10.7	..	" ..	4 29 p.m.	12.6	..
" ..	2 30 p.m.	10.7	..	June 24, ..	4 30 p.m.	12.2	..
June 8, ..	2 20 p.m.	9.6	..	" ..	4 40 p.m.	12.1	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	S ₁₀₀₀	1904.		°C.	S ₁₀₀₀
June 24, ..	4 50 p.m.	12.1	..	July 15, ..	9 0 p.m.	13.0	..
" ..	5 0 p.m.	12.1	..	July 16, ..	9 24 a.m.	12.8	..
June 25, ..	5 20 p.m.	12.0	..	" ..	9 50 p.m.	12.8	..
" ..	5 30 p.m.	11.9	..	July 17, ..	10 16 a.m.	13.0	..
" ..	5 40 p.m.	11.9	..	" ..	10 40 p.m.	12.6	..
June 26, ..	6 0 p.m.	12.1	..	July 18, ..	11 5 a.m.	13.1	..
" ..	6 10 p.m.	12.0	..	" ..	11 31 p.m.	13.0	..
" ..	6 20 p.m.	12.0	..	" ..	Midnight.	13.0	..
" ..	6 30 p.m.	12.0	..	July 19, ..	12 25 p.m.	13.4	..
June 27, ..	7 0 p.m.	12.2	..	July 20, ..	12 35 a.m.	13.0	..
" ..	7 10 p.m.	12.1	..	" ..	1 25 p.m.	13.4	..
" ..	7 30 p.m.	12.1	..	July 21, ..	1 57 a.m.	13.2	..
June 28, ..	8 0 a.m.	12.6	34.34	" ..	2 29 p.m.	13.0	..
" ..	8 10 a.m.	12.5	..	July 22, ..	3 0 a.m.	13.4	..
" ..	8 20 a.m.	12.5	..	" ..	3 34 p.m.	13.6	..
" ..	8 30 a.m.	12.5	..	July 23, ..	4 8 a.m.	13.4	..
June 29, ..	8 30 a.m.	12.0	..	" ..	4 41 p.m.	13.8	..
" ..	8 40 a.m.	12.0	..	July 24, ..	5 14 a.m.	13.4	..
" ..	8 50 a.m.	12.0	..	" ..	5 43 p.m.	13.0	..
June 30, ..	9 0 a.m.	12.2	..	July 25, ..	6 10 a.m.	13.4	..
" ..	9 10 a.m.	12.1	..	" ..	6 35 p.m.	13.8	..
" ..	9 20 a.m.	12.1	..	July 26, ..	6 55 a.m.	13.6	..
" ..	9 30 a.m.	12.1	..	" ..	7 14 p.m.	13.6	..
July 1, ..	10 0 a.m.	11.5	..	July 27, ..	7 33 a.m.	13.6	34.38
" ..	10 10 a.m.	11.4	..	" ..	7 50 p.m.	13.6	..
" ..	10 20 a.m.	11.4	..	July 28, ..	8 8 a.m.	14.0	..
July 2, ..	9 22 a.m.	12.1	..	" ..	8 25 p.m.	14.0	..
" ..	11 0 a.m.	11.8	..	July 29, ..	8 30 a.m.	14.2	..
" ..	11 10 a.m.	11.7	..	" ..	8 44 p.m.	14.0	..
" ..	11 20 a.m.	11.7	..	July 30, ..	9 0 a.m.	14.4	..
" ..	11 30 a.m.	11.7	..	" ..	9 19 p.m.	14.0	..
" ..	10 41 p.m.	12.0	..	July 31, ..	9 37 a.m.	14.2	..
July 3, ..	11 0 a.m.	12.0	..	" ..	9 54 p.m.	14.0	..
" ..	11 21 p.m.	12.0	..	August 1, ..	10 11 a.m.	14.4	..
July 4, ..	11 42 a.m.	12.2	..	" ..	10 28 p.m.	14.0	..
" ..	11 58 p.m.	12.0	..	August 2, ..	10 40 a.m.	14.6	..
July 5, ..	12 4 a.m.	12.0	..	" ..	10 50 a.m.	14.5	..
" ..	12 30 p.m.	12.8	34.34	" ..	11 5 a.m.	14.5	..
July 6, ..	1 0 a.m.	12.0	..	August 3, ..	Midday.	14.3	..
" ..	1 25 p.m.	12.8	..	" ..	12 10 p.m.	14.2	..
July 7, ..	1 52 a.m.	12.0	..	" ..	12 20 p.m.	14.2	..
" ..	2 25 p.m.	13.0	..	August 4, ..	12 38 p.m.	14.6	..
July 8, ..	3 0 a.m.	12.2	..	" ..	12 50 p.m.	14.6	..
" ..	3 24 p.m.	12.8	..	" ..	1 3 p.m.	14.5	..
July 9, ..	3 54 a.m.	12.8	..	August 5, ..	1 40 p.m.	14.6	34.42
" ..	4 25 p.m.	13.2	..	" ..	1 50 p.m.	14.5	..
July 10, ..	4 54 a.m.	12.8	..	" ..	2 0 p.m.	14.5	..
" ..	5 22 p.m.	13.0	..	" ..	2 10 p.m.	14.5	..
July 11, ..	5 49 a.m.	12.8	..	August 6, ..	2 50 p.m.	14.2	..
" ..	6 16 p.m.	13.0	..	" ..	3 0 p.m.	14.1	..
July 12, ..	6 38 a.m.	12.8	..	" ..	3 10 p.m.	14.1	..
" ..	7 0 p.m.	12.8	..	August 7, ..	3 40 p.m.	14.6	..
July 13, ..	7 30 a.m.	12.8	..	" ..	3 50 p.m.	14.5	..
" ..	7 47 p.m.	12.8	34.40	" ..	4 0 p.m.	14.5	..
July 14, ..	8 9 a.m.	13.0	..	" ..	4 10 p.m.	14.5	..
" ..	8 30 p.m.	13.0	..	August 8, ..	5 0 p.m.	14.4	..
July 15, ..	8 34 a.m.	13.0	..	" ..	5 10 p.m.	14.3	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N. Long 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
August 8,	5 20 p.m.	14.3	..	August 25,	7 50 p.m.	14.2	..
August 9,	6 30 p.m.	14.6	..	" "	8 0 p.m.	14.2	..
" "	6 40 p.m.	14.5	..	" "	8 10 p.m.	14.1	..
" "	6 50 p.m.	14.5	..	August 26,	8 15 a.m.	14.8	..
" "	7 0 p.m.	14.5	..	" "	8 25 a.m.	14.8	..
August 10,	7 20 a.m.	14.1	..	" "	8 35 a.m.	14.8	..
" "	7 30 a.m.	14.0	..	" "	8 45 a.m.	14.7	..
" "	7 40 a.m.	14.0	..	August 27,	8 40 a.m.	14.6	..
August 11,	8 0 a.m.	14.4	..	" "	8 50 a.m.	14.6	..
" "	8 10 a.m.	14.3	..	" "	9 0 a.m.	14.5	..
" "	8 20 a.m.	14.3	..	August 28,	9 0 a.m.	14.5	34.49
August 12,	8 30 a.m.	14.6	34.45	" "	9 10 a.m.	14.4	..
" "	8 40 a.m.	14.5	..	" "	9 20 a.m.	14.4	..
" "	8 50 a.m.	14.5	..	" "	9 30 a.m.	14.4	..
" "	9 0 a.m.	14.5	..	August 29,	9 30 a.m.	14.9	..
August 13,	10 0 a.m.	14.8	..	August 30,	9 50 a.m.	14.7	..
" "	10 10 a.m.	14.7	..	" "	10 0 a.m.	14.7	..
" "	10 20 a.m.	14.7	..	" "	10 10 a.m.	14.6	..
August 14,	11 0 a.m.	14.1	..	" "	10 20 a.m.	14.6	..
" "	11 10 a.m.	14.0	..	August 31,	10 30 a.m.	14.8	..
" "	11 20 a.m.	14.0	..	" "	10 40 a.m.	14.7	..
" "	11 30 a.m.	14.0	..	" "	10 50 a.m.	14.7	..
August 15,	11 20 a.m.	14.8	..	Sept. 1,	11 9 a.m.	15.0	..
" "	11 30 a.m.	14.8	..	" "	11 30 p.m.	14.6	..
" "	11 40 a.m.	14.7	..	Sept. 2,	11 53 a.m.	14.9	..
" "	11 50 a.m.	14.7	..	" "	12 5 p.m.	14.9	..
August 16,	11 40 a.m.	14.6	..	Sept. 3,	12 25 a.m.	14.8	..
" "	11 50 a.m.	14.5	..	" "	12 35 a.m.	14.8	..
" "	Midday.	14.5	..	" "	1 0 p.m.	14.6	34.45
August 17,	12 10 p.m.	14.6	..	" "	1 15 p.m.	14.6	..
" "	12 20 p.m.	14.5	..	Sept. 4,	1 27 a.m.	14.6	..
" "	12 30 p.m.	14.5	..	" "	2 0 p.m.	14.8	..
August 18,	1 0 p.m.	14.6	..	" "	2 30 p.m.	14.8	..
" "	1 10 p.m.	14.6	..	Sept. 5,	2 40 a.m.	15.0	..
" "	1 20 p.m.	14.5	..	" "	3 19 p.m.	15.0	..
" "	1 30 p.m.	14.5	..	Sept. 6,	4 0 a.m.	14.4	..
August 19,	2 10 p.m.	14.4	..	" "	4 30 p.m.	15.0	..
" "	2 20 p.m.	14.4	..	" "	4 40 p.m.	15.0	..
" "	2 30 p.m.	14.3	34.45	Sept. 7,	5 10 a.m.	14.6	..
August 20,	3 20 p.m.	14.8	..	" "	5 35 p.m.	15.0	..
" "	3 30 p.m.	14.8	..	" "	5 50 p.m.	15.0	..
" "	3 40 p.m.	14.7	..	Sept. 8,	6 0 a.m.	14.8	..
" "	3 50 p.m.	14.7	..	" "	6 28 p.m.	15.0	..
August 21,	4 0 p.m.	14.6	..	Sept. 9,	6 51 a.m.	14.8	34.54
" "	4 10 p.m.	14.6	..	" "	7 30 a.m.	14.8	..
" "	4 20 p.m.	14.5	..	" "	7 11 p.m.	14.6	..
August 22,	5 0 p.m.	14.8	..	Sept. 10,	7 34 a.m.	14.6	..
" "	5 10 p.m.	14.8	..	" "	8 0 p.m.	14.8	..
" "	5 20 p.m.	14.7	..	Sept. 11,	8 23 a.m.	14.8	..
" "	5 30 p.m.	14.7	..	" "	8 45 a.m.	14.9	..
August 23,	6 0 p.m.	14.6	..	" "	8 30 p.m.	14.8	..
" "	6 10 p.m.	14.5	..	Sept. 12,	8 44 a.m.	14.8	..
" "	6 20 p.m.	14.5	..	" "	9 8 p.m.	14.6	..
August 24,	7 0 p.m.	14.8	..	Sept. 13,	9 31 a.m.	14.6	..
" "	7 10 p.m.	14.7	..	" "	10 0 a.m.	14.8	..
" "	7 20 p.m.	14.7	..	" "	9 53 p.m.	14.5	..
" "	7 30 p.m.	14.7	..	Sept. 14,	10 15 a.m.	14.8	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1004.		°C.	‰	1904.		°C.	‰
Sept. 14, ..	10 30 a.m.	14.8	..	Sept. 28, ..	9 26 p.m.	14.7	..
" ..	10 37 p.m.	14.4	..	" ..	9 35 p.m.	14.6	..
Sept. 15, ..	11 0 a.m.	14.0	..	Sept. 29, ..	9 43 a.m.	14.8	..
" ..	11 30 a.m.	14.0	..	" ..	10 0 a.m.	14.8	..
" ..	11 26 p.m.	14.9	..	" ..	10 0 p.m.	14.6	..
Sept. 16, ..	11 51 a.m.	15.0	34.56	" ..	10 15 p.m.	14.6	..
" ..	12 22 p.m.	15.0	..	Sept. 30, ..	10 17 a.m.	14.7	..
Sept. 17, ..	1 0 a.m.	14.9	..	" ..	10 35 a.m.	14.7	..
" ..	1 10 a.m.	14.9	..	" ..	10 37 p.m.	14.4	..
" ..	1 20 p.m.	15.0	..	" ..	10 55 p.m.	14.4	..
" ..	1 40 p.m.	15.0	..	Oct. 1, ..	11 0 a.m.	14.6	..
" ..	2 0 p.m.	15.0	..	" ..	11 20 p.m.	14.4	..
Sept. 18, ..	2 0 a.m.	14.8	..	Oct. 2, ..	Midday.	14.5	..
" ..	2 10 a.m.	14.8	..	" ..	12 10 p.m.	14.4	..
" ..	2 30 p.m.	15.0	..	" ..	12 20 p.m.	14.4	..
" ..	2 40 p.m.	15.1	..	Oct. 3, ..	1 0 p.m.	14.8	..
" ..	2 50 p.m.	15.0	..	" ..	1 10 p.m.	14.7	..
" ..	3 0 p.m.	14.0	..	" ..	1 20 p.m.	14.7	..
Sept. 19, ..	3 23 a.m.	14.6	..	Oct. 4, ..	2 40 p.m.	14.5	..
" ..	4 0 p.m.	15.0	..	" ..	2 50 p.m.	14.4	..
" ..	4 10 p.m.	15.0	..	" ..	3 0 p.m.	14.4	34.54
Sept. 20, ..	4 34 a.m.	14.4	..	" ..	3 10 p.m.	14.4	..
" ..	5 4 p.m.	15.0	..	Oct. 5, ..	4 10 p.m.	15.0	..
" ..	5 20 p.m.	15.0	..	" ..	4 20 p.m.	14.1	..
" ..	5 30 p.m.	14.9	..	" ..	4 30 p.m.	14.1	..
" ..	5 35 p.m.	14.9	..	Oct. 6, ..	5 10 p.m.	14.2	..
Sept. 21, ..	5 32 a.m.	14.5	..	" ..	5 20 p.m.	14.1	..
" ..	5 50 a.m.	14.2	..	" ..	5 30 p.m.	14.1	..
" ..	5 55 p.m.	15.0	..	" ..	5 40 p.m.	14.1	..
" ..	6 10 p.m.	14.6	..	Oct. 7, ..	6 10 p.m.	14.6	..
Sept. 22, ..	6 16 a.m.	14.4	..	" ..	6 20 p.m.	14.5	..
" ..	6 30 a.m.	14.4	..	" ..	6 30 p.m.	14.5	..
" ..	6 36 p.m.	14.4	..	Oct. 8, ..	7 0 a.m.	13.8	..
" ..	6 50 p.m.	14.6	..	" ..	7 10 a.m.	13.8	..
Sept. 23, ..	6 51 a.m.	14.4	..	" ..	7 20 a.m.	13.7	..
" ..	7 0 a.m.	14.4	..	Oct. 9, ..	7 30 a.m.	13.9	..
" ..	7 7 p.m.	14.6	..	" ..	7 40 a.m.	13.8	..
" ..	7 20 p.m.	14.6	..	" ..	7 50 a.m.	13.8	..
Sept. 24, ..	7 0 a.m.	14.0	..	" ..	8 0 a.m.	13.8	..
" ..	7 30 a.m.	14.4	34.63	Oct. 10, ..	8 0 a.m.	13.8	..
" ..	7 34 p.m.	14.4	34.61	" ..	8 10 a.m.	13.6	34.56
" ..	8 4 p.m.	14.3	..	" ..	8 20 a.m.	13.6	..
Sept. 25, ..	7 50 a.m.	14.4	..	" ..	8 30 a.m.	13.6	..
" ..	8 0 a.m.	14.4	..	Oct. 11, ..	9 0 a.m.	14.0	..
" ..	8 10 a.m.	14.4	..	" ..	9 10 a.m.	13.9	..
" ..	8 4 p.m.	14.4	..	" ..	9 20 a.m.	13.9	..
" ..	8 15 p.m.	14.2	..	Oct. 12, ..	9 20 a.m.	14.2	..
Sept. 26, ..	8 20 a.m.	14.8	..	" ..	9 30 a.m.	14.1	..
" ..	8 35 a.m.	14.8	..	" ..	9 40 a.m.	14.1	..
" ..	8 30 p.m.	14.2	..	Oct. 13, ..	10 0 a.m.	13.9	..
" ..	9 0 p.m.	14.6	..	" ..	10 10 a.m.	13.8	..
Sept. 27, ..	8 37 a.m.	14.6	..	" ..	10 20 a.m.	13.8	..
" ..	8 50 a.m.	14.6	..	" ..	10 30 a.m.	13.8	..
" ..	8 54 p.m.	14.6	..	Oct. 14, ..	10 50 a.m.	13.6	..
" ..	9 5 p.m.	14.4	..	" ..	11 0 a.m.	13.6	..
Sept. 28, ..	9 10 a.m.	14.8	..	" ..	11 10 a.m.	13.5	..
" ..	9 30 a.m.	14.7	..	Oct. 15, ..	11 30 a.m.	13.9	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	8‰	1904.		°C.	8‰
Oct. 16, ..	11 40 a.m.	13.9	..	Oct. 31, ..	11 50 a.m.	13.3	..
" ..	11 50 a.m.	13.8	..	" ..	Midday.	13.3	..
" ..	Midday.	13.8	..	Nov. 2, ..	12 50 p.m.	13.6	..
Oct. 16, ..	12 20 p.m.	14.0	..	" ..	1 0 p.m.	13.6	..
" ..	12 30 p.m.	13.9	..	" ..	1 10 p.m.	13.5	..
" ..	12 40 p.m.	13.9	..	" ..	2 40 p.m.	13.2	..
" ..	12 50 p.m.	13.9	..	Nov. 3, ..	3 14 a.m.	13.0	..
Oct. 17, ..	1 40 p.m.	14.4	..	" ..	3 46 a.m.	13.2	..
" ..	1 50 p.m.	14.3	..	" ..	4 0 p.m.	13.2	34.63
" ..	2 0 p.m.	14.3	..	" ..	4 15 p.m.	13.2	..
Oct. 18, ..	3 30 p.m.	14.2	..	Nov. 4, ..	4 21 a.m.	13.2	..
" ..	3 40 p.m.	14.1	..	" ..	4 21 p.m.	13.2	..
" ..	3 50 p.m.	14.1	..	" ..	4 30 p.m.	13.1	..
Oct. 19, ..	4 40 p.m.	13.8	..	" ..	4 45 p.m.	13.1	..
" ..	4 50 p.m.	13.6	..	Nov. 5, ..	5 14 a.m.	13.4	..
" ..	5 0 p.m.	13.6	..	" ..	5 45 p.m.	13.0	..
" ..	6 10 p.m.	13.6	..	" ..	5 55 p.m.	13.0	..
Oct. 20, ..	6 30 a.m.	13.6	..	" ..	6 6 p.m.	13.0	..
" ..	6 40 a.m.	13.6	..	Nov. 6, ..	6 11 a.m.	12.8	..
" ..	6 50 a.m.	13.5	..	" ..	6 36 p.m.	13.0	..
Oct. 21, ..	6 0 a.m.	13.8	..	" ..	6 40 p.m.	13.0	..
" ..	6 10 a.m.	13.7	..	" ..	6 50 p.m.	13.0	..
" ..	6 20 a.m.	13.7	..	Nov. 7, ..	7 0 a.m.	13.0	34.63
" ..	6 30 a.m.	13.7	..	" ..	7 15 a.m.	13.0	..
Oct. 22, ..	6 30 a.m.	13.4	..	" ..	7 30 a.m.	13.0	..
" ..	6 40 a.m.	13.3	..	" ..	7 0 p.m.	12.4	..
" ..	6 50 a.m.	13.3	..	" ..	7 15 p.m.	12.4	..
Oct. 23, ..	7 0 a.m.	13.6	..	" ..	7 30 p.m.	12.2	..
" ..	7 10 a.m.	13.6	..	Nov. 8, ..	7 36 a.m.	12.2	..
" ..	7 20 a.m.	13.6	..	" ..	8 0 p.m.	12.4	..
" ..	7 30 a.m.	13.5	..	" ..	8 10 p.m.	12.4	..
Oct. 24, ..	7 40 a.m.	13.6	..	" ..	8 20 p.m.	12.4	..
" ..	7 50 a.m.	13.5	..	Nov. 9, ..	8 21 a.m.	13.0	..
" ..	8 0 a.m.	13.6	..	" ..	8 35 a.m.	13.0	..
Oct. 25, ..	8 0 a.m.	14.0	..	" ..	8 40 a.m.	13.0	..
" ..	8 10 a.m.	14.0	..	" ..	8 30 p.m.	12.6	..
" ..	8 20 a.m.	13.9	..	" ..	8 40 p.m.	12.6	..
" ..	8 30 a.m.	13.0	..	" ..	8 45 p.m.	12.5	..
Oct. 26, ..	8 30 a.m.	13.4	..	Nov. 10, ..	9 0 a.m.	12.6	..
" ..	8 40 a.m.	13.4	..	" ..	9 10 a.m.	12.4	..
" ..	8 50 a.m.	13.3	..	" ..	9 20 a.m.	12.4	..
Oct. 27, ..	9 10 a.m.	13.6	..	" ..	9 0 p.m.	12.7	..
" ..	9 20 a.m.	13.6	..	" ..	9 15 p.m.	12.7	..
" ..	9 30 a.m.	13.5	..	Nov. 11, ..	9 26 a.m.	12.7	..
" ..	9 40 a.m.	13.6	..	" ..	9 40 a.m.	12.7	..
Oct. 28, ..	9 30 a.m.	13.8	..	" ..	9 40 p.m.	12.4	..
" ..	9 40 a.m.	13.8	..	" ..	9 50 p.m.	12.4	..
" ..	9 50 a.m.	13.7	..	" ..	10 0 p.m.	12.5	..
Oct. 29, ..	10 0 a.m.	13.0	..	Nov. 12, ..	10 10 a.m.	12.6	..
" ..	10 10 a.m.	13.0	..	" ..	10 20 a.m.	12.6	..
" ..	10 20 a.m.	13.0	..	" ..	10 25 a.m.	12.6	..
" ..	10 30 a.m.	13.0	..	" ..	10 25 p.m.	12.4	..
Oct. 30, ..	11 0 a.m.	13.2	..	" ..	10 36 p.m.	12.4	..
" ..	11 10 a.m.	13.2	..	Nov. 13, ..	10 50 a.m.	12.8	..
" ..	11 20 a.m.	13.1	..	" ..	11 0 a.m.	12.8	..
Oct. 31, ..	11 30 a.m.	13.4	..	" ..	11 10 p.m.	12.6	..
" ..	11 40 a.m.	13.3	..	" ..	11 20 p.m.	12.6	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N, Long 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Nov. 14, ..	11 47 a.m.	12.8	..	Nov. 29, ..	11 53 p.m.	11.1	..
" ..	11 55 a.m.	12.8	..	Nov. 30, ..	12 24 a.m.	11.1	34.70
" ..	12 14 p.m.	12.8	..	" ..	1 0 p.m.	11.6	34.76
Nov. 15, ..	12 45 a.m.	12.6	..	" ..	1 10 p.m.	11.8	..
" ..	1 20 p.m.	12.8	34.67	Dec. 1, ..	1 40 a.m.	11.2	..
" ..	1 30 p.m.	12.8	..	" ..	2 15 p.m.	11.2	..
Nov. 16, ..	1 56 a.m.	12.2	..	" ..	2 30 p.m.	11.4	..
" ..	2 34 p.m.	12.8	..	Dec. 2, ..	2 47 a.m.	11.2	..
" ..	2 40 p.m.	12.6	..	" ..	3 10 p.m.	11.2	..
Nov. 17, ..	3 0 a.m.	12.2	..	" ..	3 20 p.m.	11.0	..
" ..	3 39 p.m.	12.5	..	Dec. 3, ..	3 50 a.m.	10.8	..
" ..	3 50 p.m.	12.5	..	" ..	4 25 p.m.	11.1	..
Nov. 18, ..	4 0 a.m.	12.4	..	" ..	4 35 p.m.	11.0	..
" ..	4 35 p.m.	12.4	..	Dec. 4, ..	4 54 a.m.	11.2	..
" ..	4 45 p.m.	12.4	..	" ..	5 21 p.m.	11.2	..
Nov. 19, ..	5 0 a.m.	12.4	..	" ..	5 30 p.m.	11.2	..
" ..	5 22 p.m.	12.2	..	Dec. 5, ..	5 50 a.m.	10.8	..
" ..	5 35 p.m.	12.2	..	" ..	6 0 a.m.	10.8	..
Nov. 20, ..	5 42 a.m.	11.8	..	" ..	8 14 p.m.	10.8	..
" ..	5 55 a.m.	11.6	..	" ..	8 30 p.m.	10.8	..
" ..	8 0 p.m.	12.0	..	Dec. 6, ..	8 38 a.m.	10.8	..
" ..	8 10 p.m.	12.0	..	" ..	8 50 a.m.	10.6	..
" ..	8 15 p.m.	11.8	..	" ..	7 11 p.m.	10.8	..
Nov. 21, ..	8 23 a.m.	11.2	..	" ..	7 20 p.m.	10.8	..
" ..	8 41 p.m.	11.4	..	Dec. 7, ..	7 21 a.m.	10.5	..
" ..	6 50 p.m.	11.4	..	" ..	7 30 a.m.	10.6	34.67
Nov. 22, ..	7 0 a.m.	11.4	..	" ..	7 42 p.m.	10.2	34.60
" ..	7 10 a.m.	11.2	..	" ..	7 50 p.m.	10.2	..
" ..	7 11 p.m.	10.8	..	Dec. 8, ..	8 5 a.m.	9.6	..
" ..	7 20 p.m.	11.0	..	" ..	8 10 a.m.	10.0	..
" ..	7 30 p.m.	11.0	..	" ..	8 20 a.m.	10.0	..
Nov. 23, ..	7 30 a.m.	10.8	..	" ..	8 26 p.m.	10.2	..
" ..	7 50 a.m.	11.0	34.89	" ..	8 35 p.m.	10.2	..
" ..	7 30 p.m.	11.0	..	Dec. 9, ..	8 30 a.m.	10.2	..
" ..	7 45 p.m.	11.0	..	" ..	8 40 a.m.	10.2	..
Nov. 24, ..	8 0 a.m.	11.0	..	" ..	8 48 p.m.	10.4	..
" ..	8 10 a.m.	11.2	..	" ..	9 0 p.m.	10.8	..
" ..	8 21 p.m.	10.6	..	Dec. 10, ..	9 0 a.m.	10.0	..
" ..	8 35 p.m.	11.0	..	" ..	9 10 a.m.	10.2	..
Nov. 25, ..	8 30 a.m.	11.0	..	" ..	9 29 p.m.	9.8	..
" ..	8 45 a.m.	11.0	..	" ..	9 40 p.m.	9.8	..
" ..	8 42 p.m.	11.1	..	Dec. 11, ..	9 51 a.m.	10.2	..
" ..	9 0 p.m.	11.1	..	" ..	10 0 a.m.	10.2	..
Nov. 26, ..	9 0 a.m.	11.2	..	" ..	10 11 p.m.	10.2	..
" ..	9 15 a.m.	11.2	..	" ..	10 20 p.m.	10.2	..
" ..	9 23 p.m.	11.0	..	Dec. 12, ..	10 31 a.m.	10.4	..
" ..	9 35 p.m.	11.0	..	" ..	10 55 p.m.	9.0	..
Nov. 27, ..	9 45 a.m.	11.2	..	" ..	11 5 p.m.	9.2	..
" ..	9 55 a.m.	11.2	..	Dec. 13, ..	11 17 a.m.	9.8	..
" ..	10 0 p.m.	11.4	..	" ..	11 35 a.m.	9.8	..
" ..	10 15 p.m.	11.4	..	" ..	11 41 p.m.	9.4	..
Nov. 28, ..	10 31 a.m.	11.4	..	Dec. 14, ..	11 58 a.m.	9.8	34.66
" ..	10 45 a.m.	11.4	..	" ..	12 31 p.m.	9.8	..
" ..	10 55 p.m.	11.1	..	Dec. 15, ..	1 0 a.m.	9.2	..
" ..	11 15 p.m.	11.1	..	" ..	1 31 p.m.	9.8	..
Nov. 29, ..	11 25 a.m.	11.2	..	" ..	1 40 p.m.	9.7	..
" ..	11 30 a.m.	11.2	..	Dec. 16, ..	2 0 a.m.	9.8	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

SOUTH ARKLOW LIGHTSHIP. Lat. 52° 41' N., Long. 5° 47' W. 26 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Dec. 16, ..	2 30 p.m.	9.8	34.51	Dec. 24, ..	8 40 p.m.	9.6	..
" ..	2 40 p.m.	9.8	..	Dec. 25, ..	8 51 a.m.	9.8	..
Dec. 17, ..	3 0 a.m.	9.8	..	" ..	9 5 a.m.	9.8	..
" ..	3 30 p.m.	10.2	..	" ..	9 13 p.m.	9.6	..
" ..	3 40 p.m.	10.0	..	" ..	9 20 p.m.	9.7	..
Dec. 18, ..	4 0 a.m.	9.6	..	Dec. 26, ..	9 35 a.m.	9.7	..
" ..	4 30 p.m.	9.6	..	" ..	9 45 a.m.	9.7	..
" ..	4 40 p.m.	9.8	..	" ..	10 0 p.m.	9.6	..
Dec. 19, ..	5 0 a.m.	9.8	..	" ..	10 10 p.m.	9.6	..
" ..	5 22 p.m.	9.8	..	Dec. 27, ..	10 23 a.m.	9.6	..
" ..	5 40 p.m.	9.8	..	" ..	10 35 a.m.	9.6	..
Dec. 20, ..	5 45 a.m.	10.0	..	" ..	10 49 p.m.	9.6	..
" ..	6 8 p.m.	9.8	..	" ..	11 0 p.m.	9.6	..
" ..	6 29 p.m.	9.8	..	Dec. 28, ..	11 16 a.m.	9.8	..
Dec. 21, ..	6 29 a.m.	9.6	..	" ..	11 30 a.m.	9.8	..
" ..	6 48 p.m.	9.4	..	" ..	11 44 p.m.	9.6	..
" ..	7 0 p.m.	9.6	..	Dec. 29, ..	12 10 a.m.	9.7	..
Dec. 22, ..	7 15 a.m.	9.6	34.54	" ..	12 42 p.m.	9.7	..
" ..	7 25 a.m.	9.6	..	" ..	12 50 p.m.	9.7	..
" ..	7 27 p.m.	9.4	..	Dec. 30, ..	1 14 a.m.	9.6	..
Dec. 23, ..	7 47 a.m.	9.6	..	" ..	1 47 p.m.	9.0	..
" ..	8 7 p.m.	9.4	..	" ..	2 0 p.m.	9.0	..
" ..	8 15 p.m.	9.4	..	Dec. 31, ..	2 19 a.m.	8.6	..
Dec. 24, ..	8 27 a.m.	9.4	..	" ..	2 32 p.m.	..	34.47
" ..	8 40 a.m.	9.6	..	" ..	2 52 p.m.	9.0	..
" ..	8 30 p.m.	9.4	..	" ..	3 0 p.m.	9.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONINGBEG LIGHTSHIP.

Lat. 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Salinity.	Surface Temperature.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.	*	°C.	‰	1904.		°C.	‰
Jan. 18, ..	7 30 p.m.	8.2	34.71	Feb. 16, ..	7 39 p.m.	6.8	33.93
Jan. 19, ..	7 50 p.m.	8.2	34.72	Feb. 17, ..	7 55 a.m.	7.0	..
Jan. 20, ..	8 55 a.m.	8.2	..	..	8 14 p.m.	7.4	..
Jan. 21, ..	9 0 p.m.	8.2	..	Feb. 18, ..	8 34 a.m.	7.4	..
..	9 21 a.m.	8.1	..	..	8 55 p.m.	7.4	..
..	9 42 p.m.	8.1	..	Feb. 19, ..	9 16 a.m.	7.5	..
Jan. 22, ..	10 3 a.m.	8.2	..	..	9 36 p.m.	7.4	..
..	10 24 p.m.	8.2	..	Feb. 20, ..	9 57 a.m.	7.4	..
Jan. 23, ..	10 45 a.m.	8.3	..	..	10 10 p.m.	7.5	..
..	11 6 p.m.	8.1	..	March 1, ..	1 46 a.m.	7.0	..
Jan. 24, ..	11 27 a.m.	8.1	..	..	2 14 p.m.	7.2	..
..	11 48 p.m.	7.4	..	March 2, ..	2 40 a.m.	7.2	34.70
Jan. 25, ..	12 9 a.m.	8.0	34.72	..	3 2 p.m.	7.2	34.65
..	12 30 p.m.	8.2	34.70	March 3, ..	3 26 a.m.	7.2	..
Jan. 26, ..	12 51 a.m.	8.3	..	..	3 50 p.m.	7.1	..
..	1 12 p.m.	8.1	..	March 4, ..	4 11 a.m.	6.9	..
Jan. 27, ..	1 33 a.m.	8.3	..	..	4 34 p.m.	7.0	..
..	1 54 p.m.	8.1	..	March 5, ..	4 55 a.m.	6.9	..
Jan. 28, ..	2 36 p.m.	8.0	..	..	5 15 p.m.	7.0	..
Jan. 29, ..	2 57 a.m.	8.0	..	March 6, ..	5 35 a.m.	6.9	..
..	3 18 p.m.	7.8	..	..	5 52 p.m.	6.8	..
Jan. 30, ..	3 39 a.m.	8.0	..	March 7, ..	6 11 a.m.	6.8	..
..	4 0 p.m.	8.0	..	..	6 30 p.m.	7.0	..
Jan. 31, ..	4 21 a.m.	8.0	..	March 8, ..	6 51 a.m.	7.1	..
..	4 42 p.m.	7.8	..	..	7 14 p.m.	7.0	..
Feb. 1, ..	5 3 a.m.	7.6	..	March 9, ..	7 42 a.m.	7.0	34.70
..	5 28 p.m.	8.0	34.65	..	8 18 p.m.	7.0	34.70
Feb. 2, ..	5 54 a.m.	8.0	..	March 10, ..	8 54 a.m.	7.0	..
..	6 28 p.m.	8.0	..	..	9 33 p.m.	7.0	..
Feb. 3, ..	6 53 a.m.	8.0	..	March 11, ..	10 12 a.m.	7.3	..
..	7 17 p.m.	8.7	..	..	10 50 p.m.	7.0	..
Feb. 4, ..	7 42 a.m.	8.0	..	March 12, ..	11 23 a.m.	7.0	..
..	8 9 p.m.	8.0	..	..	11 59 p.m.	7.0	..
Feb. 5, ..	8 35 a.m.	7.0	..	March 13, ..	12 30 p.m.	7.2	..
..	9 2 p.m.	7.0	..	March 14, ..	12 55 a.m.	7.0	..
Feb. 6, ..	9 29 a.m.	7.8	..	..	1 21 p.m.	7.0	..
..	9 57 p.m.	7.6	..	March 15, ..	1 42 a.m.	7.0	..
Feb. 7, ..	10 24 a.m.	7.9	..	..	2 2 p.m.	7.4	..
..	10 54 p.m.	7.8	..	March 16, ..	2 21 a.m.	7.1	..
Feb. 8, ..	11 24 a.m.	7.8	..	..	2 37 p.m.	7.4	..
..	12 14 p.m.	..	34.70	March 17, ..	2 52 a.m.	7.1	34.63
..	11 58 p.m.	7.8	..	..	3 8 p.m.	7.1	34.60
Feb. 9, ..	12 32 a.m.	7.8	..	March 18, ..	3 23 a.m.	7.2	..
..	1 7 p.m.	7.9	..	..	3 39 p.m.	7.2	..
Feb. 10, ..	1 43 a.m.	7.8	..	March 19, ..	3 54 a.m.	7.2	..
..	2 29 p.m.	7.8	..	..	4 11 p.m.	7.2	..
Feb. 11, ..	3 5 a.m.	7.8	..	March 20, ..	4 29 a.m.	7.2	..
..	3 40 p.m.	7.6	..	..	4 44 p.m.	7.3	..
Feb. 12, ..	4 14 a.m.	8.0	..	March 21, ..	5 1 a.m.	7.2	..
..	4 50 p.m.	7.9	..	..	5 17 p.m.	7.4	..
Feb. 13, ..	5 22 a.m.	7.6	..	March 22, ..	5 33 a.m.	7.2	..
..	5 46 p.m.	7.6	..	..	5 50 p.m.	7.4	..
Feb. 14, ..	6 9 a.m.	7.7	..	March 23, ..	6 11 a.m.	7.3	..
..	6 30 p.m.	7.5	..	..	6 31 p.m.	7.6	..
Feb. 15, ..	6 48 a.m.	7.5	..	March 24, ..	6 55 a.m.	7.2	..
..	7 6 p.m.	7.2	..	..	7 22 p.m.	7.4	34.65
Feb. 16, ..	7 23 a.m.	7.2	34.17	March 25, ..	7 59 a.m.	7.2	..

*Observations previous to March 1st were not taken at the right time of tide.

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONINGBEG LIGHTSHIP.

Lat. 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
March 25,	8 37 p.m.	7.2	..	April 24,	9 0 a.m.	8.7	..
March 26,	9 17 a.m.	7.2	..	"	9 4 p.m.	8.4	..
"	9 56 p.m.	7.2	..	April 25,	9 39 a.m.	8.4	..
March 27,	10 36 a.m.	7.2	..	"	10 15 p.m.	8.0	..
"	11 12 p.m.	7.4	..	April 26,	10 50 a.m.	8.2	..
March 28,	11 50 a.m.	7.8	..	"	11 26 p.m.	8.2	..
March 29,	12 25 a.m.	7.4	..	April 27,	12 30 p.m.	8.4	..
"	12 55 p.m.	7.4	..	April 28,	12 58 a.m.	8.3	..
March 30,	1 25 a.m.	7.0	..	"	1 25 p.m.	8.3	..
"	1 51 p.m.	7.4	..	April 29,	1 54 a.m.	8.4	..
March 31,	2 40 p.m.	7.4	34.74	"	2 18 p.m.	8.6	..
April 1,	3 2 a.m.	7.2	34.81	April 30,	2 40 a.m.	8.4	34.69
"	3 23 p.m.	7.4	..	"	3 2 p.m.	8.3	34.87
April 2,	3 47 a.m.	7.2	..	May 1,	3 23 a.m.	8.3	..
"	4 8 p.m.	7.6	..	"	3 45 p.m.	8.2	..
April 3,	4 29 a.m.	7.4	..	May 2,	4 5 a.m.	8.2	..
"	4 49 p.m.	7.6	..	"	4 27 p.m.	8.7	..
April 4,	5 10 a.m.	7.4	..	May 3,	4 48 a.m.	8.6	..
"	5 28 p.m.	7.6	..	"	5 5 p.m.	8.6	..
April 5,	5 48 a.m.	7.6	..	May 4,	5 24 a.m.	8.6	..
"	6 0 p.m.	7.7	..	"	5 43 p.m.	8.6	..
April 6,	6 23 a.m.	7.7	..	May 5,	6 3 a.m.	8.6	..
"	6 45 p.m.	7.8	..	"	6 21 p.m.	8.8	..
April 7,	7 10 a.m.	7.7	34.69	May 6,	6 43 a.m.	8.7	..
"	7 41 p.m.	7.0	34.63	"	7 6 p.m.	8.4	..
April 8,	8 17 a.m.	7.6	..	May 7,	7 38 a.m.	8.6	34.79
"	8 53 p.m.	7.8	..	"	8 10 p.m.	8.6	34.81
April 9,	9 28 a.m.	8.0	..	May 8,	8 42 a.m.	8.6	..
"	9 6 p.m.	7.8	..	"	9 14 p.m.	8.8	..
April 10,	10 40 a.m.	7.9	..	May 9,	9 48 a.m.	9.8	..
"	11 13 p.m.	8.0	..	"	10 20 p.m.	8.9	..
April 11,	11 44 a.m.	8.2	..	May 10,	10 49 a.m.	8.8	..
"	11 44 p.m.	7.7	..	"	11 19 p.m.	8.8	..
April 12,	12 14 a.m.	7.8	..	May 11,	11 46 a.m.	8.9	..
"	12 38 p.m.	8.2	..	May 12,	12 15 a.m.	9.0	..
April 13,	1 1 a.m.	8.0	..	"	12 38 p.m.	9.2	..
"	1 23 p.m.	8.0	..	May 13,	1 1 a.m.	9.0	..
April 14,	1 43 a.m.	8.0	..	"	1 23 p.m.	8.9	..
"	2 2 p.m.	8.2	..	May 14,	1 44 a.m.	9.0	..
April 15,	2 19 a.m.	8.2	..	"	2 5 p.m.	9.4	..
"	2 36 p.m.	8.3	..	May 15,	2 25 a.m.	8.9	..
April 16,	2 53 a.m.	8.0	..	"	2 43 p.m.	9.4	34.87
"	3 10 p.m.	8.4	..	May 16,	3 2 a.m.	9.0	..
April 17,	3 27 a.m.	8.2	..	"	3 22 p.m.	9.2	..
"	3 45 p.m.	8.1	..	May 17,	3 42 a.m.	9.1	..
April 18,	4 3 a.m.	8.0	..	"	4 3 p.m.	9.2	..
"	4 23 p.m.	8.4	..	May 18,	4 26 a.m.	9.1	..
April 19,	4 41 a.m.	8.0	..	"	4 46 p.m.	9.4	..
"	4 59 p.m.	8.4	..	May 19,	5 7 a.m.	9.0	..
April 20,	5 18 a.m.	8.0	..	"	5 30 p.m.	9.6	..
"	5 38 p.m.	8.2	..	May 20,	5 52 a.m.	9.1	..
April 21,	5 59 a.m.	8.6	..	"	6 15 p.m.	9.4	..
"	6 21 p.m.	8.4	..	May 21,	6 38 a.m.	9.2	..
April 22,	6 44 a.m.	8.4	..	"	7 6 p.m.	9.5	..
"	7 12 p.m.	8.2	..	May 22,	7 39 a.m.	9.5	..
April 23,	7 48 a.m.	8.2	..	"	8 15 p.m.	9.8	34.83
"	8 27 p.m.	8.6	..	May 23,	8 50 a.m.	9.4	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONINGBEG LIGHTSHIP.

Lat 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
May 23, ..	9 18 p.m.	9.4	..	June 22, ..	0 27 a.m.	12.0	..
May 24, ..	9 48 a.m.	9.4	..	" "	0 50 p.m.	11.8	..
" "	10 22 p.m.	9.6	..	June 23, ..	10 29 a.m.	13.0	..
May 25, ..	10 57 a.m.	9.4	..	" "	11 3 p.m.	11.9	..
" "	11 32 p.m.	9.8	..	June 24, ..	11 38 a.m.	11.0	..
May 26, ..	12 6 p.m.	9.4	..	June 25, ..	12 12 a.m.	12.0	..
May 27, ..	12 35 a.m.	9.6	..	" "	12 44 p.m.	12.1	..
" "	1 4 p.m.	9.8	..	June 26, ..	1 12 a.m.	11.0	..
May 28, ..	1 31 a.m.	9.4	..	" "	1 39 p.m.	12.0	..
" "	1 58 p.m.	10.2	..	June 27, ..	2 0 a.m.	11.8	..
May 29, ..	2 23 a.m.	9.8	..	" "	2 29 p.m.	12.2	34.79
" "	2 44 p.m.	10.1	..	June 28, ..	2 50 a.m.	11.4	34.74
May 30, ..	3 5 a.m.	9.8	..	" "	3 9 p.m.	12.6	..
" "	3 26 p.m.	9.3	..	June 29, ..	3 29 a.m.	11.4	..
May 31, ..	3 48 a.m.	9.8	..	" "	3 40 p.m.	12.2	..
" "	4 7 p.m.	9.4	..	June 30, ..	4 8 a.m.	11.8	..
June 1, ..	4 27 a.m.	9.0	..	" "	4 28 p.m.	12.2	..
" "	4 26 p.m.	9.0	..	July 1, ..	4 45 a.m.	11.8	..
June 2, ..	5 4 a.m.	9.8	..	" "	5 2 p.m.	12.2	..
" "	5 20 p.m.	10.6	..	July 2, ..	5 20 a.m.	11.8	..
June 3, ..	5 41 a.m.	9.8	..	" "	5 30 p.m.	12.2	..
" "	5 58 p.m.	10.4	..	July 3, ..	5 54 a.m.	11.8	..
June 4, ..	6 17 a.m.	10.2	..	" "	6 11 p.m.	12.4	..
" "	6 37 p.m.	11.4	..	July 4, ..	6 27 a.m.	12.0	..
June 5, ..	0 59 a.m.	11.0	..	" "	6 40 p.m.	12.3	..
" "	7 23 p.m.	11.0	..	July 5, ..	7 7 a.m.	12.4	..
June 6, ..	7 53 a.m.	10.8	34.85	" "	7 29 p.m.	12.4	34.72
" "	8 23 p.m.	11.0	34.85	July 6, ..	7 57 a.m.	12.2	..
June 7, ..	8 53 a.m.	10.0	..	" "	8 26 p.m.	12.3	..
" "	9 21 p.m.	10.6	..	July 7, ..	8 57 a.m.	12.5	..
June 8, ..	9 50 a.m.	10.4	..	" "	9 27 p.m.	12.4	..
" "	10 18 p.m.	10.0	..	July 8, ..	0 54 a.m.	13.4	..
June 9, ..	10 48 a.m.	10.6	..	" "	10 25 p.m.	12.4	..
" "	11 17 p.m.	10.4	..	July 9, ..	10 57 a.m.	13.4	..
June 10, ..	11 46 a.m.	11.8	..	" "	11 29 p.m.	12.8	..
June 11, ..	12 17 a.m.	11.4	..	July 10, ..	12 2 p.m.	13.2	..
" "	12 45 p.m.	12.4	..	July 11, ..	12 32 a.m.	12.6	..
June 12, ..	1 11 a.m.	11.6	..	" "	1 3 p.m.	13.0	..
" "	1 36 p.m.	11.4	..	July 12, ..	1 29 a.m.	12.4	..
June 13, ..	1 57 a.m.	10.8	..	" "	1 57 p.m.	13.0	..
" "	2 20 p.m.	12.0	34.76	July 13, ..	2 23 a.m.	12.8	34.70
June 14, ..	2 41 a.m.	11.4	34.76	" "	2 48 p.m.	13.4	..
" "	3 3 p.m.	11.6	..	July 14, ..	3 11 a.m.	12.0	..
June 15, ..	3 20 a.m.	11.4	..	" "	3 36 p.m.	13.1	..
" "	3 50 p.m.	11.6	..	July 15, ..	4 0 a.m.	13.0	..
June 16, ..	4 14 a.m.	11.4	..	" "	4 26 p.m.	13.0	..
" "	4 37 p.m.	11.6	..	July 16, ..	4 50 a.m.	12.8	..
June 17, ..	5 1 a.m.	11.6	..	" "	5 14 p.m.	13.4	..
" "	5 23 p.m.	11.8	..	July 17, ..	5 37 a.m.	12.6	..
June 18, ..	5 47 a.m.	11.8	..	" "	6 0 p.m.	13.0	..
" "	6 11 p.m.	11.6	..	July 18, ..	0 22 a.m.	13.0	..
June 19, ..	6 33 a.m.	11.4	..	" "	6 42 p.m.	13.4	..
" "	6 59 p.m.	12.2	..	July 19, ..	7 4 a.m.	12.8	..
June 20, ..	7 24 a.m.	12.1	..	" "	7 29 p.m.	13.2	34.70
" "	7 54 p.m.	12.0	34.78	July 20, ..	7 59 a.m.	13.0	..
June 21, ..	8 28 a.m.	12.0	34.72	" "	8 31 p.m.	13.5	..
" "	9 0 p.m.	12.0	..	July 21, ..	9 3 a.m.	13.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONNINGBEG LIGHTSHIP.

Lat. 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
July 21, ..	9 34 p.m.	13.2	..	August 20, ..	9 40 a.m.	14.4	..
July 22, ..	10 5 a.m.	13.4	..	..	10 18 p.m.	14.4	..
..	10 40 p.m.	13.4	..	August 21, ..	10 54 a.m.	14.6	..
July 23, ..	11 14 a.m.	14.2	..	..	11 31 p.m.	14.0	..
..	11 51 p.m.	14.0	..	August 22, ..	12 7 p.m.	14.4	..
July 24, ..	12 25 p.m.	14.2	..	August 23, ..	12 38 a.m.	14.2	..
July 25, ..	12 56 a.m.	13.2	..	..	1 6 p.m.	14.6	..
..	1 24 p.m.	14.4	..	August 24, ..	1 30 a.m.	14.2	..
July 26, ..	1 48 a.m.	13.8	..	..	1 52 p.m.	14.6	..
..	2 13 p.m.	13.8	..	August 25, ..	2 2 a.m.	14.0	..
July 27, ..	2 34 a.m.	13.2	34.63	..	2 31 p.m.	14.2	..
..	2 51 p.m.	13.8	..	August 26, ..	2 48 a.m.	14.0	34.85
July 28, ..	3 10 a.m.	13.0	..	..	3 5 p.m.	14.4	..
..	3 28 p.m.	14.0	..	August 27, ..	3 21 a.m.	14.2	..
July 29, ..	3 46 a.m.	14.0	..	..	3 37 p.m.	14.2	..
..	4 4 p.m.	14.2	..	August 28, ..	3 54 a.m.	14.2	..
July 30, ..	4 21 a.m.	14.0	..	..	4 9 p.m.	14.2	..
..	4 37 p.m.	14.2	..	August 29, ..	4 25 a.m.	14.2	..
July 31, ..	4 54 a.m.	14.0	..	..	4 42 p.m.	14.4	..
..	5 9 p.m.	14.2	..	August 30, ..	4 55 a.m.	14.4	..
August 1, ..	5 25 a.m.	13.8	..	..	5 10 p.m.	14.4	..
..	5 40 p.m.	13.4	..	August 31, ..	5 26 a.m.	14.0	..
August 2, ..	5 56 a.m.	13.5	..	..	5 43 p.m.	14.0	..
..	6 15 p.m.	13.8	..	Sept. 1, ..	6 0 a.m.	14.2	..
August 3, ..	6 32 a.m.	14.0	..	..	6 15 p.m.	14.2	..
..	6 50 p.m.	14.6	..	Sept. 2, ..	6 35 a.m.	14.0	..
August 4, ..	7 9 a.m.	14.8	..	..	6 57 p.m.	14.0	..
..	7 35 p.m.	14.8	34.67	Sept. 3, ..	7 24 a.m.	14.2	..
August 5, ..	8 5 a.m.	15.0	..	..	7 59 p.m.	14.2	..
..	8 37 p.m.	14.6	..	Sept. 4, ..	8 34 a.m.	14.4	..
August 6, ..	9 10 a.m.	14.6	..	..	9 11 p.m.	14.2	..
..	9 44 p.m.	14.6	..	Sept. 5, ..	9 49 a.m.	14.2	..
August 7, ..	10 17 a.m.	15.0	..	..	10 28 p.m.	14.2	..
..	10 54 p.m.	14.4	..	Sept. 6, ..	11 5 a.m.	14.2	..
August 8, ..	11 31 a.m.	15.4	..	..	11 43 p.m.	14.2	..
August 9, ..	12 6 a.m.	14.6	..	Sept. 7, ..	12 17 p.m.	14.4	..
..	12 38 p.m.	14.8	..	Sept. 8, ..	12 48 a.m.	14.4	..
August 10, ..	1 9 a.m.	14.2	..	..	1 18 p.m.	14.4	..
..	1 37 p.m.	14.8	..	Sept. 9, ..	1 45 a.m.	14.2	..
August 11, ..	2 6 a.m.	14.0	..	..	2 11 p.m.	14.4	..
..	2 32 p.m.	14.6	34.74	Sept. 10, ..	2 35 a.m.	14.2	34.88
August 12, ..	2 55 a.m.	14.0	..	..	2 59 p.m.	14.4	..
..	3 21 p.m.	14.4	..	Sept. 11, ..	3 23 a.m.	14.4	..
August 13, ..	3 45 a.m.	14.0	..	..	3 46 p.m.	14.4	..
..	4 8 p.m.	14.3	..	Sept. 12, ..	4 9 a.m.	14.3	..
August 14, ..	4 32 a.m.	14.2	..	..	4 32 p.m.	14.0	..
..	4 53 p.m.	14.4	..	Sept. 13, ..	4 53 a.m.	13.8	..
August 15, ..	5 17 a.m.	14.0	..	..	5 13 p.m.	14.2	..
..	5 38 p.m.	14.3	..	Sept. 14, ..	5 33 a.m.	14.2	..
August 16, ..	6 1 a.m.	14.0	..	..	5 54 p.m.	14.4	..
..	6 21 p.m.	14.2	..	Sept. 15, ..	6 14 a.m.	14.2	..
August 17, ..	6 40 a.m.	14.0	..	..	6 33 p.m.	14.3	..
..	7 2 p.m.	14.2	..	Sept. 16, ..	6 58 a.m.	14.2	..
August 18, ..	7 27 a.m.	14.2	34.74	..	7 27 p.m.	14.6	..
..	7 59 p.m.	14.2	..	Sept. 17, ..	8 1 a.m.	14.5	..
August 19, ..	8 32 a.m.	14.0	..	..	8 37 p.m.	14.2	..
..	9 5 p.m.	14.2	..	Sept. 18, ..	9 14 a.m.	14.4	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONINGBEG LIGHTSHIP.

Lat. 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Sept. 18, ..	9 53 p.m.	14.2	..	Oct. 18, ..	9 52 a.m.	13.8	..
Sept. 19, ..	10 30 a.m.	14.2	..	Oct. 18, ..	10 27 p.m.	13.6	..
Sept. 19, ..	11 7 p.m.	14.0	..	Oct. 19, ..	11 0 a.m.	13.8	..
Sept. 20, ..	11 40 a.m.	14.4	..	Oct. 19, ..	11 31 p.m.	13.4	..
Sept. 21, ..	12 3 a.m.	14.4	..	Oct. 20, ..	12 1 p.m.	13.8	..
Sept. 21, ..	12 39 p.m.	14.2	..	Oct. 21, ..	12 26 a.m.	13.4	..
Sept. 22, ..	1 4 a.m.	14.2	..	Oct. 21, ..	12 50 p.m.	13.6	..
Sept. 22, ..	1 25 p.m.	14.2	..	Oct. 22, ..	1 11 a.m.	13.2	..
Sept. 23, ..	1 45 a.m.	14.0	..	Oct. 22, ..	1 30 p.m.	13.4	..
Sept. 23, ..	2 4 p.m.	14.4	..	Oct. 23, ..	1 49 a.m.	13.2	..
Sept. 24, ..	2 21 a.m.	14.2	..	Oct. 23, ..	2 6 p.m.	13.4	..
Sept. 24, ..	2 36 p.m.	14.2	35.01	Oct. 24, ..	2 23 a.m.	13.2	..
Sept. 25, ..	2 52 a.m.	13.6	..	Oct. 24, ..	2 38 p.m.	13.4	34.96
Sept. 25, ..	3 7 p.m.	14.0	..	Oct. 25, ..	2 54 a.m.	13.0	..
Sept. 26, ..	3 23 a.m.	14.0	..	Oct. 25, ..	3 12 p.m.	13.0	..
Sept. 26, ..	3 39 p.m.	14.2	..	Oct. 26, ..	3 28 a.m.	13.2	..
Sept. 27, ..	3 55 a.m.	14.4	..	Oct. 26, ..	3 46 p.m.	13.2	..
Sept. 27, ..	4 12 p.m.	14.4	..	Oct. 27, ..	4 3 a.m.	13.0	..
Sept. 28, ..	4 27 a.m.	14.0	..	Oct. 27, ..	4 19 p.m.	13.2	..
Sept. 28, ..	4 42 p.m.	14.4	..	Oct. 28, ..	4 37 a.m.	13.2	..
Sept. 29, ..	4 59 a.m.	14.4	..	Oct. 28, ..	4 55 p.m.	13.2	..
Sept. 29, ..	5 14 p.m.	14.2	..	Oct. 29, ..	5 14 a.m.	13.0	..
Sept. 30, ..	5 31 a.m.	14.2	..	Oct. 29, ..	5 35 p.m.	13.0	..
Oct. 1, ..	5 51 p.m.	14.2	..	Oct. 30, ..	5 53 a.m.	13.0	..
Oct. 1, ..	6 10 a.m.	14.2	..	Oct. 30, ..	6 14 p.m.	13.0	..
Oct. 1, ..	6 32 p.m.	14.0	..	Oct. 31, ..	6 41 a.m.	13.0	..
Oct. 2, ..	6 56 a.m.	13.7	35.03	Oct. 31, ..	7 13 p.m.	13.0	34.97
Oct. 2, ..	7 32 p.m.	14.0	..	Nov. 1, ..	7 53 a.m.	13.0	..
Oct. 3, ..	8 10 a.m.	14.0	..	Nov. 1, ..	8 31 p.m.	13.2	..
Oct. 3, ..	8 48 p.m.	14.0	..	Nov. 2, ..	9 7 a.m.	13.2	..
Oct. 4, ..	9 27 a.m.	14.2	..	Nov. 2, ..	9 42 p.m.	13.0	..
Oct. 4, ..	10 6 p.m.	14.0	..	Nov. 3, ..	10 17 a.m.	13.2	..
Oct. 5, ..	10 42 a.m.	14.0	..	Nov. 3, ..	10 54 p.m.	13.0	..
Oct. 5, ..	11 21 p.m.	14.0	..	Nov. 4, ..	11 29 a.m.	13.2	..
Oct. 6, ..	11 56 a.m.	14.0	..	Nov. 5, ..	12 2 a.m.	13.2	..
Oct. 7, ..	12 28 a.m.	13.8	..	Nov. 5, ..	12 32 p.m.	13.2	..
Oct. 7, ..	12 51 p.m.	13.8	..	Nov. 6, ..	1 1 a.m.	13.0	..
Oct. 8, ..	1 23 a.m.	13.4	..	Nov. 6, ..	1 28 p.m.	13.0	..
Oct. 8, ..	1 49 p.m.	14.0	..	Nov. 7, ..	1 53 a.m.	13.2	..
Oct. 9, ..	2 13 a.m.	13.4	34.99	Nov. 7, ..	2 17 p.m.	12.8	..
Oct. 9, ..	2 37 p.m.	13.4	..	Nov. 8, ..	2 38 a.m.	12.4	35.10
Oct. 10, ..	3 1 a.m.	13.4	..	Nov. 8, ..	3 1 p.m.	12.6	..
Oct. 10, ..	3 24 p.m.	13.8	..	Nov. 9, ..	3 24 a.m.	13.0	..
Oct. 11, ..	3 46 a.m.	13.6	..	Nov. 9, ..	3 45 p.m.	12.8	..
Oct. 11, ..	4 8 p.m.	13.8	..	Nov. 10, ..	4 7 a.m.	12.6	..
Oct. 12, ..	4 28 a.m.	13.4	..	Nov. 10, ..	4 27 p.m.	12.5	..
Oct. 12, ..	4 49 p.m.	13.4	..	Nov. 11, ..	4 48 a.m.	12.6	..
Oct. 13, ..	5 9 a.m.	13.8	..	Nov. 11, ..	5 8 p.m.	13.0	..
Oct. 13, ..	5 29 p.m.	13.8	..	Nov. 12, ..	5 28 a.m.	12.8	..
Oct. 14, ..	5 47 a.m.	14.2	..	Nov. 12, ..	5 47 p.m.	12.8	..
Oct. 14, ..	6 7 p.m.	13.8	..	Nov. 13, ..	6 5 a.m.	12.4	..
Oct. 15, ..	6 29 a.m.	13.8	..	Nov. 13, ..	6 28 p.m.	12.8	..
Oct. 15, ..	6 55 p.m.	13.6	..	Nov. 14, ..	6 50 a.m.	12.8	..
Oct. 16, ..	7 27 a.m.	13.4	34.96	Nov. 14, ..	7 12 p.m.	12.0	..
Oct. 16, ..	8 2 p.m.	13.4	..	Nov. 15, ..	7 53 a.m.	12.6	..
Oct. 17, ..	8 38 a.m.	13.4	..	Nov. 15, ..	8 3 a.m.	..	34.96
Oct. 17, ..	9 15 p.m.	13.8	..	Nov. 15, ..	8 28 p.m.	12.0	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

CONINGBEG LIGHTSHIP.

Lat. 52° 2' N., Long. 6° 40' W. 29 fathoms.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Nov. 16, ..	9 2 a.m.	13.8	..	Dec. 9, ..	4 11 p.m.	10.2	..
" 17, ..	9 36 p.m.	12.4	..	Dec. 10, ..	4 31 a.m.	10.2	..
" 17, ..	10 8 a.m.	12.4	..	" ..	4 50 p.m.	9.8	..
" 18, ..	10 39 p.m.	12.4	..	Dec. 11, ..	5 9 a.m.	10.4	..
Nov. 18, ..	11 8 a.m.	12.5	..	" ..	5 27 p.m.	10.0	..
" ..	11 36 p.m.	12.4	..	Dec. 12, ..	5 46 a.m.	10.0	..
Nov. 19, ..	12 4 p.m.	12.4	..	" ..	6 5 p.m.	9.8	..
Nov. 20, ..	12 27 a.m.	12.0	..	Dec. 13, ..	6 24 a.m.	8.8	..
" ..	12 50 p.m.	12.2	..	" ..	6 44 p.m.	10.0	..
Nov. 21, ..	1 12 a.m.	11.6	..	Dec. 14, ..	7 6 a.m.	10.0	..
" ..	1 33 p.m.	11.8	..	" ..	7 35 p.m.	9.8	34.87
Nov. 22, ..	1 54 a.m.	11.2	..	Dec. 15, ..	8 3 a.m.	10.0	..
" ..	2 12 p.m.	11.4	..	" ..	8 33 p.m.	10.2	..
Nov. 23, ..	2 28 a.m.	11.0	35.12	Dec. 16, ..	9 3 a.m.	10.0	..
" ..	2 47 p.m.	11.0	..	" ..	9 33 p.m.	10.0	..
Nov. 24, ..	3 5 a.m.	11.0	..	Dec. 17, ..	10 4 a.m.	10.0	..
" ..	3 24 p.m.	11.0	..	" ..	10 34 p.m.	10.0	..
Nov. 25, ..	3 44 a.m.	11.2	..	Dec. 18, ..	11 4 a.m.	9.6	..
" ..	4 4 p.m.	11.2	..	" ..	11 34 p.m.	9.4	..
Nov. 26, ..	4 24 a.m.	11.2	..	Dec. 19, ..	12 2 p.m.	9.8	..
" ..	4 44 p.m.	11.0	..	Dec. 20, ..	12 28 a.m.	9.6	..
Nov. 27, ..	5 5 a.m.	11.2	..	" ..	12 54 p.m.	9.6	..
" ..	5 27 p.m.	11.0	..	Dec. 21, ..	1 18 a.m.	9.6	..
Nov. 28, ..	5 48 a.m.	11.2	..	" ..	1 41 p.m.	9.4	..
" ..	6 10 p.m.	11.2	..	Dec. 22, ..	2 5 a.m.	9.4	..
Nov. 29, ..	6 35 a.m.	11.0	..	" ..	2 28 p.m.	9.8	34.81
" ..	7 1 p.m.	11.0	..	Dec. 23, ..	2 49 a.m.	10.0	..
Nov. 30, ..	7 36 a.m.	11.4	34.96	" ..	3 10 p.m.	10.0	..
" ..	8 12 p.m.	11.4	..	Dec. 24, ..	3 31 a.m.	9.8	..
Dec. 1, ..	8 46 a.m.	11.2	..	" ..	3 54 p.m.	9.8	..
" ..	9 16 p.m.	11.0	..	Dec. 25, ..	4 15 a.m.	10.0	..
Dec. 2, ..	9 49 a.m.	11.0	..	" ..	4 36 p.m.	10.0	..
" ..	10 24 p.m.	11.2	..	Dec. 26, ..	4 58 a.m.	9.8	..
Dec. 3, ..	10 58 a.m.	10.8	..	" ..	5 21 p.m.	9.8	..
" ..	11 32 p.m.	11.0	..	Dec. 27, ..	5 44 a.m.	9.8	..
Dec. 4, ..	12 5 p.m.	11.0	..	" ..	6 7 p.m.	10.0	..
Dec. 5, ..	12 36 a.m.	10.8	..	Dec. 28, ..	6 30 a.m.	10.0	..
" ..	1 3 p.m.	10.8	..	" ..	6 52 p.m.	10.4	..
Dec. 6, ..	1 32 a.m.	10.8	..	Dec. 29, ..	7 18 a.m.	10.0	..
" ..	1 59 p.m.	10.8	..	" ..	7 47 p.m.	10.2	..
Dec. 7, ..	2 22 a.m.	10.4	34.88	Dec. 30, ..	8 20 a.m.	10.0	..
" ..	2 44 p.m.	10.2	..	" ..	8 52 p.m.	10.4	..
Dec. 8, ..	3 8 a.m.	10.2	..	Dec. 31, ..	9 24 a.m.	10.4	..
" ..	3 29 p.m.	10.4	..	" ..	9 54 p.m.	10.2	..
Dec. 9, ..	3 51 a.m.	10.2	..				

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

FASTNET ROCK LIGHTHOUSE.

Lat. 51° 23' N., Long. 9° 36' W.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
Feb. 3, ..	3 30 p.m.	8.2	35.09	May 16, ..	2 30 p.m.	9.4	..
Feb. 4, ..	4 0 p.m.	8.0	..	May 17, ..	3 0 p.m.	9.4	..
Feb. 18, ..	3 0 p.m.	7.8	35.22	May 18, ..	3 30 p.m.	10.0	..
Feb. 19, ..	2 0 p.m.	8.0	..	May 19, ..	4 0 p.m.	10.2	..
Feb. 20, ..	5 0 p.m.	8.2	..	May 20, ..	5 0 p.m.	10.0	..
Feb. 21, ..	7 0 a.m.	8.0	..	May 22, ..	6 0 p.m.	10.0	..
Feb. 22, ..	5 30 p.m.	8.2	..	May 24, ..	9 0 a.m.	10.2	..
Feb. 26, ..	8 0 a.m.	8.2	..	May 25, ..	10 0 a.m.	10.0	..
Feb. 27, ..	9 30 a.m.	8.2	..	May 26, ..	11 30 a.m.	10.2	..
Feb. 28, ..	10 30 a.m.	8.0	..	May 27, ..	12 15 p.m.	10.4	..
Feb. 29, ..	11 30 a.m.	8.0	..	May 30, ..	2 0 p.m.	10.4	..
March 1, ..	12 30 p.m.	7.2	..	May 31, ..	3 0 p.m.	11.0	35.21
March 2, ..	1 30 p.m.	7.8	35.01	June 1, ..	4 30 p.m.	10.4	..
March 3, ..	2 30 p.m.	7.4	..	June 4, ..	5 0 p.m.	11.0	..
March 4, ..	3 30 p.m.	7.4	..	June 5, ..	5 40 p.m.	11.1	..
March 8, ..	6 0 p.m.	7.2	..	June 5, ..	6 30 p.m.	11.2	..
March 9, ..	8 0 a.m.	7.0	34.96	June 7, ..	7 15 p.m.	11.4	..
March 10, ..	7 45 a.m.	7.0	..	June 8, ..	8 0 p.m.	11.2	..
March 11, ..	8 45 a.m.	7.0	..	June 9, ..	9 45 a.m.	12.1	..
March 12, ..	9 45 a.m.	7.1	..	June 10, ..	10 30 a.m.	12.4	..
March 14, ..	11 45 a.m.	7.2	..	June 11, ..	11 15 a.m.	12.4	..
March 15, ..	12 45 p.m.	7.4	..	June 12, ..	Midday.	12.4	..
March 16, ..	1 45 p.m.	7.6	..	June 13, ..	12 45 p.m.	13.0	..
March 19, ..	3 0 p.m.	7.8	..	June 18, ..	4 30 p.m.	11.2	..
March 21, ..	3 45 p.m.	8.0	..	June 19, ..	5 15 p.m.	11.1	..
March 22, ..	4 30 p.m.	8.1	35.04	June 20, ..	6 0 p.m.	11.3	..
March 24, ..	5 30 p.m.	8.0	..	June 21, ..	6 45 p.m.	11.2	..
March 25, ..	6 30 p.m.	8.1	..	June 22, ..	7 30 p.m.	11.4	..
March 26, ..	7 30 p.m.	8.0	..	June 23, ..	8 15 p.m.	11.2	..
March 28, ..	9 30 a.m.	8.0	..	June 24, ..	9 0 a.m.	11.3	..
April 5, ..	5 30 p.m.	8.0	35.07	June 25, ..	9 45 a.m.	11.2	..
April 7, ..	7 30 p.m.	8.0	..	June 26, ..	10 30 a.m.	11.1	..
April 8, ..	8 0 a.m.	8.2	..	June 27, ..	11 15 a.m.	11.2	..
April 11, ..	10 30 a.m.	8.0	..	June 28, ..	Midday.	11.1	..
April 16, ..	3 0 p.m.	8.3	..	June 29, ..	12 45 p.m.	11.0	..
April 20, ..	5 40 p.m.	8.0	35.21	"	1 30 p.m.	..	35.16
April 22, ..	5 0 p.m.	8.4	..	June 30, ..	1 30 p.m.	11.1	..
April 23, ..	6 0 a.m.	8.5	..	July 1, ..	2 15 p.m.	11.2	..
April 24, ..	7 0 a.m.	8.8	..	July 2, ..	3 0 p.m.	11.0	..
April 25, ..	8 0 a.m.	8.8	..	July 3, ..	3 45 p.m.	10.4	..
April 25, ..	9 0 a.m.	9.0	..	July 4, ..	4 30 p.m.	10.4	..
April 27, ..	10 0 a.m.	9.0	..	July 5, ..	6 0 p.m.	11.0	..
April 28, ..	11 0 a.m.	9.0	..	July 6, ..	6 45 p.m.	11.0	..
April 29, ..	Midday.	9.0	..	July 7, ..	9 0 a.m.	10.2	..
April 30, ..	1 0 p.m.	9.0	35.21	July 8, ..	10 0 a.m.	10.4	..
May 2, ..	3 0 p.m.	9.1	..	July 9, ..	10 50 a.m.	10.1	..
May 3, ..	4 0 p.m.	9.0	..	July 10, ..	11 40 a.m.	11.0	..
May 4, ..	5 0 p.m.	8.9	..	July 11, ..	12 30 p.m.	11.0	..
May 5, ..	6 0 p.m.	9.0	..	July 12, ..	1 30 p.m.	11.0	..
May 5, ..	7 0 p.m.	9.0	..	"	2 0 p.m.	..	35.37
May 7, ..	8 0 p.m.	9.0	35.35	July 13, ..	2 0 p.m.	11.2	..
May 8, ..	7 0 a.m.	9.0	..	July 16, ..	3 30 p.m.	11.4	..
May 9, ..	8 0 a.m.	9.1	..	July 19, ..	5 0 p.m.	11.4	..
May 10, ..	9 0 a.m.	9.1	..	July 20, ..	8 0 a.m.	11.2	..
May 11, ..	10 0 a.m.	9.2	..	July 21, ..	9 0 a.m.	11.3	..
May 12, ..	11 0 a.m.	9.2	..	July 22, ..	10 30 a.m.	12.4	..
May 13, ..	Midday.	9.2	..	July 23, ..	Midday.	14.4	..
May 14, ..	1 0 p.m.	9.3	35.10	July 24, ..	1 0 p.m.	15.0	..
May 15, ..	2 0 p.m.	9.4	..	July 25, ..	1 30 p.m.	14.4	..

HYDROGRAPHICAL OBSERVATIONS AT IRISH LIGHT STATIONS, 1904—continued.

FASTNET ROCK LIGHTHOUSE.

Lat. 51° 23' N., Long. 9° 36' W.

Date.	Hour.	Surface Temperature.	Surface Salinity.	Date.	Hour.	Surface Temperature.	Surface Salinity.
1904.		°C.	‰	1904.		°C.	‰
July 26, ..	2 30 p.m.	14.3	..	Sept. 29, ..	4 15 p.m.	14.0	..
July 27, ..	3 0 p.m.	14.4	..	Sept. 30, ..	4 45 p.m.	14.0	..
July 28, ..	3 30 p.m.	14.2	..	Oct. 1, ..	5 30 p.m.	14.2	..
July 29, ..	4 30 p.m.	14.2	34.96	Oct. 2, ..	6 0 p.m.	14.1	35.05
July 30, ..	5 0 p.m.	14.3	..	Oct. 3, ..	6 30 p.m.	14.0	..
August 1, ..	5 15 p.m.	15.0	..	Oct. 4, ..	7 0 p.m.	14.1	..
August 2, ..	6 0 p.m.	14.4	..	Oct. 5, ..	6 30 a.m.	14.2	..
August 3, ..	6 30 p.m.	14.4	..	Oct. 6, ..	7 15 a.m.	14.0	..
August 4, ..	8 45 a.m.	14.4	..	Oct. 7, ..	8 0 a.m.	13.4	..
" ..	5 45 p.m.	..	34.88	Oct. 8, ..	8 30 a.m.	13.4	..
August 5, ..	9 30 a.m.	14.8	..	Oct. 9, ..	Midday.	13.8	..
August 6, ..	10 15 a.m.	14.8	..	Oct. 10, ..	12 45 p.m.	13.8	..
August 7, ..	11 0 a.m.	14.8	..	" ..	1 30 p.m.	..	35.37
August 8, ..	11 45 a.m.	15.0	..	Oct. 11, ..	1 30 p.m.	13.6	..
August 9, ..	12 30 p.m.	15.2	..	Oct. 12, ..	2 15 p.m.	13.4	..
August 10, ..	1 15 p.m.	15.2	..	Oct. 13, ..	3 0 p.m.	12.4	..
August 11, ..	2 0 p.m.	13.0	..	Oct. 14, ..	3 45 p.m.	12.2	..
August 12, ..	2 30 p.m.	..	34.94	Oct. 16, ..	5 15 p.m.	12.4	..
" ..	2 45 p.m.	13.2	..	Oct. 18, ..	8 30 a.m.	13.0	35.15
August 13, ..	3 30 p.m.	13.0	..	Oct. 19, ..	9 15 a.m.	13.0	..
August 14, ..	4 15 p.m.	12.0	..	Oct. 20, ..	10 0 a.m.	13.2	..
August 15, ..	5 0 p.m.	11.0	..	Oct. 21, ..	10 45 a.m.	13.0	..
August 16, ..	5 45 p.m.	11.2	..	Oct. 22, ..	11 30 a.m.	12.2	..
August 17, ..	6 30 p.m.	11.0	..	Oct. 23, ..	12 15 p.m.	12.0	..
August 18, ..	7 15 p.m.	11.0	..	Oct. 24, ..	1 0 p.m.	12.2	..
August 19, ..	9 0 a.m.	13.0	..	Oct. 25, ..	1 45 p.m.	12.4	..
August 20, ..	9 45 a.m.	13.2	..	Oct. 26, ..	2 30 p.m.	12.4	..
August 21, ..	10 30 a.m.	13.0	..	Oct. 27, ..	3 15 p.m.	12.6	..
August 22, ..	11 15 a.m.	13.4	..	Oct. 28, ..	4 0 p.m.	12.8	..
August 23, ..	Midday.	13.4	..	Oct. 29, ..	4 45 p.m.	12.6	..
August 24, ..	12 45 p.m.	13.2	..	Oct. 30, ..	5 30 p.m.	12.4	..
August 25, ..	1 30 p.m.	13.0	..	Oct. 31, ..	6 0 p.m.	12.2	..
August 26, ..	2 0 p.m.	13.0	34.83	Nov. 1, ..	7 0 a.m.	12.2	..
August 27, ..	2 45 p.m.	14.0	..	Nov. 2, ..	7 45 a.m.	12.2	..
August 28, ..	3 15 p.m.	14.0	..	Nov. 3, ..	8 30 a.m.	12.0	..
August 29, ..	3 45 p.m.	13.2	..	Nov. 4, ..	10 30 a.m.	12.2	..
August 30, ..	4 15 p.m.	13.0	..	Nov. 5, ..	Midday.	13.0	..
August 31, ..	5 0 p.m.	13.0	..	Nov. 7, ..	1 30 p.m.	12.0	..
Sept. 1, ..	5 30 p.m.	12.4	..	Nov. 8, ..	2 30 p.m.	12.2	..
Sept. 2, ..	6 0 p.m.	13.0	34.79	" ..	?	..	34.88
Sept. 3, ..	6 30 p.m.	13.2	..	Nov. 10, ..	3 0 p.m.	12.0	..
Sept. 4, ..	7 15 p.m.	13.0	..	Nov. 11, ..	4 0 p.m.	12.0	..
Sept. 7, ..	9 45 a.m.	13.0	..	Nov. 12, ..	4 30 p.m.	12.0	..
Sept. 8, ..	10 30 a.m.	12.4	..	Nov. 14, ..	8 0 a.m.	12.0	..
Sept. 9, ..	11 15 a.m.	12.4	..	Nov. 15, ..	9 0 a.m.	11.3	..
" ..	12 30 p.m.	..	34.95	Nov. 17, ..	10 30 a.m.	11.2	..
Sept. 10, ..	12 30 p.m.	13.0	..	Nov. 23, ..	1 15 p.m.	10.8	..
Sept. 11, ..	1 30 p.m.	13.0	..	Nov. 24, ..	2 0 p.m.	10.6	35.07
Sept. 12, ..	2 45 p.m.	12.4	..	Nov. 25, ..	2 45 p.m.	10.4	..
Sept. 15, ..	4 50 p.m.	15.0	..	Nov. 26, ..	3 15 p.m.	10.6	..
Sept. 20, ..	9 45 a.m.	14.0	..	Nov. 27, ..	3 45 p.m.	10.4	..
Sept. 21, ..	10 30 a.m.	13.2	..	Nov. 28, ..	4 30 p.m.	10.4	..
Sept. 22, ..	11 15 a.m.	14.2	..	Nov. 29, ..	5 0 p.m.	10.6	..
Sept. 23, ..	Midday.	14.2	..	Nov. 30, ..	5 30 p.m.	10.6	..
Sept. 24, ..	1 0 p.m.	14.0	..	Dec. 3, ..	9 30 a.m.	10.4	35.16
" ..	1 30 p.m.	..	35.35	Dec. 4, ..	10 15 a.m.	10.4	..
Sept. 25, ..	2 0 p.m.	14.0	..	Dec. 23, ..	2 0 p.m.	9.4	..
Sept. 26, ..	2 30 p.m.	14.0	..	Dec. 24, ..	2 30 p.m.	9.2	35.43
Sept. 27, ..	3 15 p.m.	14.2	..	Dec. 25, ..	3 15 p.m.	9.2	..
Sept. 28, ..	3 45 p.m.	14.2	..				

INLAND FISHERIES.

- i.—Report on the Artificial Propagation of Salmonidae during the Season of 1904-1905,
by E. W. L. HOLT.
- ii.—Observations on the Spawning Season of the Rainbow Trout,
by C. ARENS, Fishculturist, Cleysingen bei Ellrich a. Harz,
Germany. (Translation).
- iii.—Record of Salmon Marking Experiments in Ireland, 1902-1905,
by A. B. E. HILLAS, B.A.
- iv.—Statistical Information relating to the Salmon Fisheries.
- v.—Substance of Reports received from Clerks of Conservators relative to Salmon Fisheries.

i.—REPORT ON THE ARTIFICIAL PROPAGATION OF
SALMONIDAE DURING THE SEASON OF 1904-1905.

BY

E. W. L. HOLT.

I estimate the number of fry turned down in the spring of 1905 at about 4,632,000 salmon, 579,000 white trout, and 273,000 brown trout.

The annexed table compares the outputs of the seasons 1903-1904 and 1904-1905. To the former have been added some returns which did not reach me in time for inclusion in my report for 1902 and 1903, and as usual the present record is probably incomplete in as far as regards small plantings of brown trout fry, while no attempt is made to tabulate transactions in rainbow trout, American brook-char, and the like.

On the whole the season of 1904-5 appears to have been favourable to artificial propagation at those hatcheries where the spawners are obtained from the main rivers or from large tributaries, and especially where they are taken in a trap, though Belleek presents a notable exception. The rivers generally remained low and fishable during the time the fish were moving up to the spawning grounds, but the absence of floods in the lesser tributaries in some cases seriously interfered with the stocking of minor hatcheries which depend for their supply on the fish which leave the larger water courses.

The same condition is in regard to its effect upon natural propagation rather difficult of interpretation. Fish will not,

Fisheries, Ireland, Sci. Invest., 1904, VII., [Published, March, 1906].

OUTPUT OF SALMON AND TROUT FRY IN IRELAND, 1903-4 AND 1904-5.

HATCHERY.	All Salmon.		Foreign Salmon.		White Trout.		Brown Trout.		REMARKS.
	1903-4.	1904-5.	1903-4.	1904-5.	1903-4.	1904-5.	1903-4.	1904-5.	
Lough Dan, R. Ovens.	-	-	-	-	-	-	10,000	12,000	
Newtownbarry, R. Slaney.	100,000	-	-	-	-	-	-	-	
Inishoge, R. Norr.	278,000*	70,000	-	-	-	-	-	-	
Cahir, R. Suir.	25,000	51,000	-	-	-	-	-	-	
Lamore, R. Blackwater.	800,000*	1,387,000*	-	-	-	-	-	-	
St Anne's, R. Lee.	-	-	-	-	-	-	-	5,000	From Lough Shannon
Skipbreen, R. Lee.	73,600	-	73,600	-	-	-	-	-	From the Woser.
R. Blackwater, Co. Kerry.	70,000	25,000	-	-	-	-	-	-	
Caragh Lake, R. Caragh.	-	-	-	-	-	-	60,000	40,000	"Lochlevena."
Killorglin, R. Lanes.	183,000*	140,000*	-	-	-	-	-	-	
Killarney, R. Lanes.	60,000*	58,000*	-	-	-	-	-	-	
Muckross, R. Lanes.	75,000*	68,000*	-	-	-	-	-	-	
Adare, R. Mague.	-	77,600	-	-	-	-	228,000	137,000	Placed in rearing ponds, Yearlings from Lough Shannon.
Castlerea, R. Suck.	-	-	-	-	-	-	-	1,500	
Castello R., Co. Galway.	-	-	-	-	270,000	320,000	-	-	
Sereche R., Co. Galway.	356,000*	295,500*	-	-	70,000*	64,000*	-	-	
Inver R., Co. Galway.	-	(a)	-	-	-	133,000	-	-	(a) "A few."
Kylesore, R. Dawson.	60,000	120,000	-	-	2,500	-	-	-	
Ballyfadare, R. Unshin.	120,000	20,000	30,000 (b)	30,000 (b)	-	-	-	-	(b) From the Woser.
Kilronan, R. Shannon.	-	-	-	-	-	-	6,000	2,500	
Larsen, R. Dawson.	-	400	-	-	-	-	-	-	
Belleek, R. Erne.	506,000*	124,000*	-	-	-	-	-	-	
Glenies, R. Owens.	220,000	173,000	-	-	-	-	-	-	
Dringlow, Co. Donegal.	-	-	-	-	-	4,000	-	-	
Glenvagh, R. Owens.	188,000	-	-	-	-	-	-	-	
Newtownstewart, R. Foyle.	240,000*	210,000*	-	-	-	-	-	-	
Kilrea, R. Bann.	305,000*	468,000*	-	-	-	-	-	-	
Lough Neagh, R. Bann.	-	-	-	-	-	-	60,000	75,000 (c)	(c) 20,000 "Lochlevena."
Buckcastle, R. Boyne.	382,000*	1,365,000*	-	-	-	-	-	-	
Totals.	4,093,600	4,632,500	165,600	20,000	342,500	572,000	361,000	273,000	

* Estimated by officers of the Department.

and indeed often cannot, go into the smaller tributaries unless there are floods, and in consequence stay in the main rivers, where they are fairly safe from poachers. Thus more fish probably survive to spawn—however the fruits of their industry may be nullified by quarrels among the lords of too adjacent ménages—and more slats get back to the sea in consistently dry than in moderately wet seasons, when high and

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low states of water alternate in the tributaries. Ova and alevins are also exempt from the dangers which beset them in mountain streams, where sudden floods may be as harmful as frost and drought.

On the other hand, in dry winters a number of streams which, however dangerous to the parents, are excellently suited to the requirements of fry, remain unstocked; and the fry are hatched in places which may not provide a sufficiency of food for all. In their movements in search of richer ground they may have to traverse zones of greater danger than exists in the streams.

Consideration of this subject may perhaps be commended to those who, with a view to the preservation of spawners, advocate the grating of all streams in which fish may be exposed to serious risk of poaching. No doubt such precaution would in some instances permit of reduction in the cost of watching; but, leaving aside the question of damage to lands by floods caused by the gratings, and the possible necessity of augmenting the staff of bailiffs to cope with a concentration of fish and poachers, it is not unlikely that the increased safety of the parents would be more than counterbalanced by starvation of the fry. I am speaking, it will be understood, of the proposition to merely close the tributaries to ascending fish. To close streams which are dangerous to spawners while providing by artificial propagation for their stocking with fry is a scheme which appears likely to give quite different results.

The returns furnished by Clerks of Boards of Conservators in regard to spawning are given below. On the whole they appear to be favourable, as indeed they almost invariably are.

It is to be feared that considerable destruction of ova was caused by the drying of the spawning beds at Killaloe in February. The Shannon, owing to the largely artificial nature of its present course, seems by no means adequately provided, in regard to its size, with spawning and fry grounds, and any serious drought on the limited reproductive areas may have a deplorable result on the future stock.

In this connection it may be noted that there are in this country a great number of streams which appear to be admirably suited to the requirements of salmon fry, but which are never stocked because the parent fish either cannot or do not reach them, though the smolts would have no difficulty in descending. The Department have under consideration the stocking of several such streams experimentally, and if the fry appear to do well the scheme may be carried out on a larger scale. That the fry will return as parr to their nursery is not to be expected, but somewhere or other from river or open sea a percentage of them should be brought to table. Naturally the proposed stocking would not be at the expense of streams where the parents would have a reasonable chance of spawning or their progeny of thriving.

Beyond the general remarks as to condition of rivers the hatchery returns for 1904-1905 demand little individual attention. Lady Margaret Charteris' hatchery at Cahir on the Suir appears for the first time upon the list, though started in the previous season. Mr. Rochford reports that it is intended to expand hatching operations there in future years, and to make arrangements for dealing more effectively with local stock in order to avoid the necessity of importation. The low output of Inistioge was due especially to scarcity of males. Arrangements were made to procure milt from elsewhere, but before this could be effected it became necessary to release the hen fish to take their chance of finding a mate in the river. The hatchery at Innishannon was used only for trout of various kinds. At Skibbereen, where the small hatchery has hitherto always been stocked with German salmon ova, the proprietors have for the present suspended the enterprise. Waterville was again idle, and, owing, among other considerations, to the high temperature of the supply stream, this cannot be altogether matter for regret. At Killorglin unusual difficulty was encountered in the capture of spawners, and it is proposed to attempt to remedy this by installing a trap on the Cottoner's river opposite the hatchery.

The Killarney hatchery used this season was erected to Mr. Oliver's designs under an agreement between the Earl of Kenmare and the Department. It is situate in the demesne on the Deenagh River, about half a mile above its entry into Lough Leane. The water is taken from the river by means of a weir under the bridge on the Killorglin road, and is led to an old mill-race from which the original supply was long since diverted. The upper part of the race is dammed to form a high-level settling pond, and the succeeding portion is filled in with stones, &c., and finished on the top so as to serve as a platform for the hatching boxes, which are supplied by a wooden shoot and taps similar to those in use at Lismore (see Report for 1902-3, Pt. II., Appendix, No. XI.). The platform is perforated by large drain pipes through which as much water as may be required passes from a sluice in the settling pond to the lower part of the race. This is divided by gratings into a number of holding ponds for spawners, and just above the point where the race discharges into the Deenagh a sluice below the lowest grating serves to maintain the necessary depth of water. An iron grid across the river prevents the upward passage of spawners and renders their capture easy, transport to the holding ponds being a matter of a few yards. There is accommodation in the hatching boxes for 500,000 ova, and the small output for 1904-5 is due to delay in completion of the works. There is a good deal of spawning ground in the Deenagh, and it is proposed to allow a reasonable head of fish to spawn there naturally, and to impound for hatching purposes only those that may be considered in excess of the natural capacity of the river.

From the Adare hatchery the fry have been turned into ponds, and Mr. Ballingal is seeking to rear them by the

method which he has adopted with great success in the case of trout. So far, however, the fry have not done very well—an experience which I believe is general with those who attempt to raise salmon fry in ponds. It is on this account that, whenever privileged to advise in regard to salmon culture, I always recommend that the fry should be transferred, with all due precautions of carriage and attention to temperature, to suitable natural fry grounds as soon as, or even a little before, they are in need of food. If at Adare, where nothing in the way of experience and care is lacking, absolute success is found hard to command, complete failure may be expected to attend the efforts of the novice.

From Inver (County Galway) it is reported that a few salmon fry were turned into the river in the 1904-5 season, and some 34,000 ova were sent to the Thames. Similar consignments appear to have been made in previous seasons. Last year I had the pleasure of assisting at an inquiry at which it was generally alleged that the Connemara salmon fisheries were in danger of serious depletion by the operations of the trammel fishermen on the coast. It is therefore pleasing to learn that the rivers still appear to produce salmon ova in excess of local requirements.

At Lareen, Mr. Singleton experimented on a small scale with boxes of much the same character as the Sandfort "floating redds" (see Report for 1901, Pt. II., Appendix, No. XIV.), but provided with a hole at the up-stream end. One was swamped by a storm, the other just before hatching time was moored immediately below an artificial bank of gravel designed to resemble a natural redd. The idea was that the alevins would resort to this bank as soon as they thought fit after hatching, and would then be under the conditions most suitable for their welfare. While not differing in other respects from the intended use of "floating redds," Mr. Singleton's device suggests the possibility of adapting to the requirements of liberated fry cuts and races which are satisfactory as regards supply and control of water, but in which an account of the nature of the bottom it would not be desirable to enlarge the fry. Since, however, in the economical use of floating redds fry are crowded therein to the utmost extent compatible with safety, it must be remembered that the artificial creation of a small extent of fry-ground would be of no ultimate advantage except in the immediate neighbourhood of large tracts of natural ground to which the fry could pass as their needs of expansion might dictate.

It was not attempted to stock the Glenveagh hatchery in 1904-5, and at Newtownbarry no spawners could be procured, as no fish took the small stream where they have generally been collected. I referred in my last report to experiments in progress for the capture of spawners in the main river at Newtownbarry in connection with the proposed enlargement of the existing hatchery to a much greater capacity. It was

considered undesirable to construct an actual weir on account of the expense and of the possible damage by flooding to valuable land. The device adopted consisted of a wood and iron crib at one side of the river, and a leader of strong netting run diagonally across towards the opposite side. The result appeared to indicate that without much more attention than was likely to be bestowed in this instance upon the manipulation of the net, according to the condition of the river, success was not to be expected, and the project was accordingly abandoned.

The Department have agreed with Mr. J. M. Roche and other gentlemen interested in the angling on the Barrow to erect a hatchery at Carlow with a capacity for 500,000 ova. It is intended to place the hatchery and holding ponds on the Burren tributary at the outskirts of the town, and to procure spawners below the mill-weirs.

Under agreement with Lord Sligo a hatchery on the Erriff, which enters the Great Killary at Aasleagh, near Leenane, is in process of construction.

The agreement between Mr. FitzHerbert and the Department, under which the annual stocking of the Boyne has averaged about a million fry, has lapsed, but will, it is hoped, be renewed before next hatching season.

At Lough Dan the two-year-old "Loch-Levens" which had been retained in the ponds for stock purposes failed to mature, and in consequence no crossing with the native race could be accomplished, but some 12,000 fry were reared from imported ova.

During last winter (1904-5) a bog slide on a tributary of the Suck, above Castlerena, resulted in the extermination of fish throughout a considerable part of that river. On application for assistance in re-stocking, the Department made a grant towards the turning down of 1,000 brown trout yearlings, and a further number of 500 was provided out of local resources.

The thanks of the Department, as well as of local anglers, are due to Dr. F. G. O'Donohoe for kindly supervising the enlargement of the fish, which was accomplished without loss.

An association has been formed for the improvement of the trout fishing of Lough Sheelin, on the head waters of the Inny. The proposals include the establishment of a small hatchery for the introduction of fresh blood, but since there seems to have been no sort of protection of spawning fish for about fifteen years, at least as much good is likely to result from the appointment of competent bailiffs.

The County Council of Kerry have urged upon the Department the necessity of starting artificial propagation of salmon on the Cashen or Peale river. There are no local facilities for the establishment of a large hatchery, but operations on a modest scale are in contemplation.

ii.—OBSERVATIONS ON THE SPAWNING SEASON OF THE RAINBOW TROUT.*

A Paper written for the International Fishery Congress,
Vienna, 1905,

by

C. ARENS, Fishculturist,

Cleysingen bei Ellrich a. Harz, Germany.

Experience with regard to the spawning season of the rainbow trout differs widely in different localities—hence the contradictory opinions held on the subject. The latter may be summarised as follows:—

One party claims that the spawning season is gradually becoming earlier and approximating itself to that of the brown trout. The other refuses to admit this, and maintains that the spawning season depends on the varying water-temperature of the winter months, in that low temperature retards, and high advances it, and that to this cause are due the local variations and the apparent earlier incidence of the season in the series of mild winters during the past decade.

My experience in breeding rainbow trout, extending now over more than twenty years, inclines me to the latter opinion, for the reasons which follow.

In the first place we must regard as an entirely separate consideration the fact that young two- and three-year-old rainbows, under equal conditions, regularly spawn very much later than older fish of from four years upwards, from which age the spawning season remains constant.

This very fact necessarily misleads inexperienced fish-breeders into the belief that the spawning season is becoming earlier, as they see the fish evidently spawning earlier each year. The cause is not, however, a possible advancement of the spawning season, but simply the increasing age of the fish; no breeder of rainbow trout, therefore, is in a position to form an opinion on the question at issue until his fifth year in the business. Among the defenders of the theory that the spawning season is gradually becoming earlier we find quite a number of young breeders, who have as yet, for the reasons mentioned, no right to form an opinion.

My establishment is fed by the Zorge, a stream from the Harz Mountains, whose source is so far off that its temperature fluctuates with that of the air, and it carries, not spring-water, but river-water of variable temperature. Consequently, in my long experience I have had opportunities of judging the influence of the different variations of the water-temperature on the date of commencement of the spawning season; and I am decidedly of opinion that cold perceptibly delays the latter, while warmth advances it. The retarding

* Translation by C. GREEN, B.A.

influence of cold affects not only the date of commencement of spawning, but in great measure also the continued ripening of the ova during the spawning season. In cold weather it is sufficient to examine the stock for ripe spawners every ten to fourteen days, during great cold once in three weeks; in warm weather it must be done every week, even twice a week, to avoid the risk of finding partly spawned fish. It has happened with me that, after warm weather in late autumn, the spawning began as early as January, but was suspended for over a month upon the sudden occurrence of long-continued cold with heavy formation of ice. The apprehension that the fish might continue spawning under the ice proved groundless; after the thaw no spent fish were found, not even many ripe fish. The spawning function, the ripening of the ova, was thus procrastinated for over a month through the cold weather occurring during the spawning season. The effect on the date of commencement of the spawning season is similar. If the latter part of autumn is cold, it is postponed to February, or even March, and *vice versa*. On these grounds it is not to be wondered at that in establishments in mountain districts the rainbow trout spawns late as a rule, often not till May, and, conversely, that where spring water of high winter temperature is used it generally spawns early, usually in December, as is actually the case.

Further, considered from a general biological point of view it is most unlikely that the rainbow trout is approximating its spawning season to that of the brown trout. It is a spring spawner, and distinguished as such by the fact that its eggs require a much smaller accumulated temperature for their development, and that the period of absorption of the yolk is much shorter than in the case of winter spawners. While the winter spawners, one and all—even those imported from America, require an accumulated temperature of 550 C. day-degrees* (990° F.) for the development of their eggs, the amount is utterly different in the case of the various species of salmonidae which spawn in spring, and is smaller the later they spawn. In the case of the rainbow trout it amounts to 400° C. (720° F.), and, moreover, the period of absorption of the yolk is about half as long as in the brown trout.

Now when it is seen with what universal solicitude Nature provides that the adolescence of the fry of salmonidae shall so proceed that they are not ready to feed until all life has waked from its winter sleep, it is most unlikely that a trout whose offspring mature so quickly as those of the rainbow should have so early a spawning season that the fry would be

* Some readers may not be familiar with this expression. A "day-degree" means a degree above freezing point (0° C., 32° F.) persisting for twenty-four hours. E.g., suppose the mean temperature for one day to be 10° C. (50° F.), then 10° Centigrade or 18° Fahrenheit of "accumulated temperature" will have been registered. Suppose the same mean temperature to continue for a week, the accumulated temperature will amount to 70° C., or 126° F.—C.G.

ready to feed while winter still prevails—as must necessarily happen if they spawn in November-December with the brown trout.

In my native place in the Harz, the brown trout of the higher ranges spawn as early as September-October, since the water temperature in those regions of long winter stands at freezing point for more than a quarter of the year, and the development of the eggs must of necessity begin early, in order that their time of incubation may not be prolonged until well into the spring. In the waters at the foot of the Harz, which even in the winter have a temperature up to $+6^{\circ}$ C. (43° F.), the brown trout do not spawn until November-December. Not far from the Harz there are two considerable streams, fed by springs, of such volume that quite close to their source they supply power to large factories, and of an equal winter temperature between $+7.5^{\circ}$ and 10° C. (45° — 50° F.). In these waters the trout do not spawn till January-February; otherwise, the fry would be ready to feed too soon. It is evident that Nature carefully fixes the general period of the first search for food by the trout fry in April-May, and that to this end the fry of spring spawners requires a much lower accumulated temperature for its maturation than that of the winter spawners, since the former spawn later, and their fry must, nevertheless, be ready to feed in April-May. Nature would be quite unnatural were it, by advancing the spawning season of the rainbow trout, to render this co-ordination of events illusory.

The rainbow trout is a fish native to water of some depth, not spring-water, and, accordingly, of variable temperature. On that account it is natural that its spawning season, as contrasted with that of winter spawners, should be related to the temperature of the water, in that warmth advances and cold retards it. A rise of temperature during the winter awakes in the fish a sense of the approach of spring, and the consequent necessity of depositing its eggs as soon as possible; a low temperature, on the other hand, the cold of winter, suppresses the thoughts of spring and the spawning instinct. If the rainbow trout is kept in spring-water the high winter temperature produces a false impression in regard to the season, an error pardonable in a fish which is native not to uniformly warm spring-water but to river-water of variable temperature.

It is possible that my deductions, though based upon the experience and often-confirmed observations of many years, may seem the speculations of an empiricist judging by instinct without the support of proof. With a desire to avoid this, I have compiled a table to show the date of commencement of the spawning season of the rainbow trout, with the air-temperature prevailing in the months of November, December and January preceding, for a number of years. This will further strengthen my argument, and place it to a certain degree upon a scientific footing.

The table begins with the year 1891, since in the preceding ten years of work (1880-1890) at one time a paucity of material, at another the youth of the fish, with the correlated lateness of their spawning season mentioned above, tended to give false impressions. The air-temperatures* have been extracted from the records of the Nordhausen Meteorological Observatory, conducted by Herr Oberlehrer Dr. Stern. Nordhausen, it is true, lies at a distance of twelve kilometres from Cleysingen, but it is similarly situated on the Zorge at the foot of the Harz, so that the air-temperature, if not the same as that of Cleysingen, is at any rate comparable thereto. In examining the table it should, further, be observed that the dates given for the opening of the spawning season are those on which the stripping of the eggs began in my establishment; sundry isolated ripe individuals are not noticed, as the stripping is never begun until a considerable number of trout are ripe together; moreover, this stripping has sometimes, from causes external to the fish (lack of time, unsuitable weather) been delayed some eight or ten days, so that the postponement of the spawning season for about a week should be neglected in drawing deductions.

A glance at the table shows that no progressive advancement of the spawning season has taken place. Even though, in the mild winters of the last eight years, the spawning seasons have begun on earlier dates, nevertheless they are grouped together in January; besides which, such early dates occurred in previous years (1892 and 1896) and, on the other hand, very late dates, as in 1891, 1893, 1897, and 1900, in no regular order. Now those retardations are connected with low temperatures in the preceding winters so clearly as to afford cogent proof of my hypothesis. If the relation of the spawning season to the mean temperature is not in every case apparent, it must be remembered that the course of the temperature changes within each month has a great deal to say to the matter. The mean may be influenced by a few exceptionally cold or warm days, or the high or low temperature may have been uniformly close to the mean throughout the month (*e.g.*, 1903); the wide variations from the mean may have occurred long previous to the spawning season or shortly before its commencement, in both of which cases it may have had no great effect, *e.g.*, 1900, when November had a high mean temperature, but the exceptionally cold December must be regarded as having determined the postponement of the spawning season to the 15th February, and 1901, when the very low temperature late in January lowered the mean, but had no corresponding influence on the spawning season, which was practically on the point of beginning, owing to the warmth of the preceding November and December. In any case, all spawning seasons remarkable

*Published originally in degs. Réaumur Converted for the benefit of Irish readers.—C.G.

for their wanton variation from the mean are so plainly characterised by corresponding persistent and uniformly distributed divergences in the temperature conditions (whether above or below the mean) that the table sufficiently supports my argument.

TABLE.

Commencement of the Spawning Season of Rainbow Trout at Cleysingen bei Ellrich.

YEAR.	Spawning began.	Air-temperature of preceding Months.							
		November.		December.		January.		Mean.	
		°C.	°F.	°C.	°F.	°C.	°F.	°C.	°F.
1881, . .	18 March, . .	+320	37.8	-7.01	19.4	-5.04	22.9	-2.95	26.7
1882, . .	5 February, . .	+248	26.5	+2.54	36.5	-2.07	28.3	+0.98	33.8
1883, . .	1 March, . .	+235	36.2	-1.46	29.4	-9.47	14.9	-2.88	26.8
1884, . .	24 February, . .	+256	36.8	+0.38	33.8	-2.25	27.9	+0.23	32.4
1885, . .	23 " . .	+580	42.3	+0.76	33.4	-5.35	22.4	+4.40	32.7
1886, . .	23 January, . .	+533	41.6	-0.49	31.1	-0.73	30.7	+1.36	34.5
1887, . .	3 March, . .	+1.08	33.9	-0.74	30.7	-4.60	23.7	-1.43	29.4
1888, . .	1 February, . .	+3.08	37.5	+1.75	35.2	+2.65	36.8	+2.09	36.5
1889, . .	24 January, . .	+4.83	40.7	+4.64	40.4	+2.65	36.8	+4.04	39.3
1890, . .	15 February, . .	+8.45	47.2	-4.35	24.2	+1.15	34.1	+1.75	35.2
1891, . .	25 January, . .	+6.66	43.9	+3.89	39.0	-7.72	18.1	+0.74	33.3
1892, . .	23 " . .	+3.70	38.7	+0.78	33.4	+3.90	39.0	+2.19	37.0
1893, . .	31 " . .	+1.20	34.2	-3.64	25.4	+6.40	33.7	-0.68	30.8
1894, . .	12 " . .	+5.95	42.7	-1.11	30.0	-2.10	28.2	+0.91	33.6
1895, . .	19 " . .	+4.45	40.0	+3.39	38.1	-2.50	27.5	+1.73	35.2

iii.—RECORD OF SALMON MARKING EXPERIMENTS IN IRELAND,

1902-1905.

BY

A. B. E. HILLAS, B.A.

Full particulars of the methods employed for marking salmon are set forth in the previous Report* on this subject.

Following the arrangements therein the recaptures of marked fish at Lismore are dealt with separately.

As in previous years, the experiment was carried out under the superintendence of Mr. Godfrey. Prior to marking, the fish were impounded in the holding ponds for varying periods, and after stripping were marked and released.

Unfortunately, it was not found practicable to have the fish weighed at the time of marking, though the lengths were accurately taken; it is probable that in many cases the weights were underestimated.

Where marking has taken place every endeavour is made to advertise the fact, and notices (see No. 1 opposite) are posted up and distributed by the gentlemen who are kind enough to undertake the marking of fish.

A short notice (see No. 2 opposite) is now issued to Boards of Conservators for attachment to salmon rod and net licences. This, apparently, has brought the matter to the attention of a large number of fishermen, and the demand for labels has increased. The principal fish buyers and their agents throughout the country have been circularised, and they have promised to have fish carefully examined for labels. It is probable, however, that some marked fish still escape notice when taken, or, from one cause or another, are not reported to the Department.

SUMMARY OF LABELS OF DIFFERENT PATTERNS RECOVERED, 1898-1905.

(Exclusive of those used at Lismore.)

Number of fish marked with plain silver label,	1,246
Number recaptured before leaving the river,	6
Number recaptured on return from the sea,	13
Number of fish marked with oxidised single plate label,	501
Number recaptured before leaving the river,	3
Number recaptured on return from the sea,	10
Number of fish marked with oxidised double plate label,	2,448
Number recaptured before leaving the river,	11
Number recaptured on return from the sea, or at sea,	33

*E. W. L. Holt, *Ann. Rep. Fish., Ireland, 1901, Pt. II., App., XIII.*, pp. 165-196 [1903].

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION
FOR IRELAND.

SALMON FISHERIES

During the winter a large number of Salmon are marked, on behalf of the Fisheries Branch of the Department of Agriculture and Technical Instruction for Ireland, with a label attached to the base of the back fin.

A REWARD OF TWO SHILLINGS AND SIXPENCE is offered for the return of each label, provided that the label is accompanied by particulars of the place and date of capture, the weight, and the length (from snout to fork of tail) of the fish from which the label was taken, and provided also that the fish was caught by lawful means.

The label and particulars should be forwarded to

THE SCIENTIFIC ADVISER,

(Fisheries Branch),

Department of Agriculture and Technical Instruction
for Ireland,

3, KILDARE PLACE, DUBLIN.

By Order of the Department,

M. P. DOWLING,

FISHERIES BRANCH.

[No. 2.]

SALMON FISHERIES.

NOTICE TO ANGLERS AND FISHERMEN.

A LARGE NUMBER OF SALMON ARE ANNUALLY MARKED on behalf of the Fisheries Branch of the Department of Agriculture and Technical Instruction, WITH A VIEW TO THE STUDY OF THE SUBSEQUENT MOVEMENTS OF THE FISH.

The labels are of oxidised silver, and are attached to the base of the back fin, and would hardly be noticed unless the hand is run along the fin.

A REWARD OF TWO SHILLINGS AND SIXPENCE is offered by the Department for the return of each label, provided that the label is accompanied by particulars of the place and date of capture, the weight and length of fish from snout to fork of tail, and provided that the fish was caught by lawful means.

When a label is found on a kelt or unseasonable fish, it is requested that the letter and

number on the label be read, and the fish immediately returned to the river without the label being removed.

All communications and returned labels should be addressed to the Scientific Adviser, Fisheries Branch, Department of Agriculture and Technical Instruction, Dublin.

ISSUE OF LABELS.—The Department are prepared to issue to responsible persons, who are willing to mark fish, a supply of labels and the necessary appliances. Full particulars can be obtained on application to the Scientific Adviser.

By Order of the Department,

M. P. DOWLING,

Fisheries Branch,

DEPARTMENT OF AGRICULTURE AND
TECHNICAL INSTRUCTION FOR
IRELAND, DUBLIN.

SUMMARY OF NUMBERS OF FISH MARKED,
1902-5.

1902-3.

RIVER.	Date of Marking.	Total No. Marked.	Number of	
			Males	Females
Ballysodare—Mr. J. W. Scott,	7:1:'03, ..	48	15	33
Bandon—Mr. F. Stenning, ..	16:2:'03 to 15:3:'03,	24	2	22
Bann—Mr. T. M'Dermott, ..	6:12:'02 to 29:1:'03,	133	27	106
Blackwater (Lismore)—Mr. J. Penrose, per Mr. J. E. Godfrey.	15:11:'02 to 12:1:'03,	355	151	204
Bush—Mr. R. M. Douglas, ..	21:1:'03 to 19:3:'03,	20	6	14
Caragh Lake—Mr. J. Moriarty,	20:1:'03 to 20:2:'03,	45	21	24
Erne—Mr. J. Swan, ..	16:12:'02 to 17:1:'03,	'04	17+	46+
Foyle—Mr. T. M'Dermott, ..	5:12:'02 to 10:1:'03,	136	66	70
Lane—Messrs. R. Power, B. St. A. Jenner, and Col. G. Nash.	9:12:'02 to 14:3:'03,	81	29	52
Nore—Major E. C. Hamilton,	10:12:'02 to 4:2:'03,	34	18	16
Owenea—Mr. J. A. Pomeroy, per Mr. H. Wilson,	29:12:'02, ..	26	9	27
Slaney—Mr. R. W. Hall-Dare, per Mr. J. Sim.	27:2:'03 to 2:4:'03,	44	11	33
Suir—Mr. William Rochfort, and Lord Donoughmore, per Mr. J. Gearon.	4:2:'03 to 16:4:'03,	40	11	29
Total,		1,060	383+	676+

* Sex of one fish not determined.

1903-4.

RIVER.	Date of Marking.	Total No. Marked	Number of	
			Males.	Females.
Ballysodare—Mr. J. W. Scott,	5:1:'04, ..	50	21	29
Bandon—Mr. B. H. S. Stephenson.	15:2:'04 to 20:2:'04,	9	1	8
Bann—Mr. T. M'Dermott, ..	16:12:'03 to 25:1:'04,	111	41	70
Blackwater (Lismore)—Mr. J. Penrose, per Mr. J. E. Godfrey.	24:11:'03 to 6:2:'04,	214	87	127
Burrischoole—Mr. H. M. Anketell-Jones.	22-24:3:'04, ..	*4	?	?
Bush—Messrs. R. M. Douglas and S. Doherty.	5:2:'04 to 13:5:'04,	45	16	29
Caragh Lake—Messrs. F. J. Chute and J. Moriarty.	18:1:'04 to 5:4:'04,	45	19	26
Corrib—Messrs. Lyden and Sons,	1:2:'04 to 9:4:'04,	16	7	9
Erne—Mr. J. Swan, ..	9:12:'03 to 16:1:'04,	138	12	126
Fergus—Mr. H. M'Donough.	2:2:'04, ..	1	—	1
Foyle—Mr. T. M'Dermott, ..	4:12:'03 to 28:1:'04,	150	46	104
Inver—Mr. J. Mason, ..	7-24:12:'03, ..	41	19	22
Killarney, Lower Lake, Rivers flowing into—Messrs. J. Scully and F. Meehan.	17:12:'03 to 14:1:'04,	55	25	30
Laune—Mr. R. Power and Col. G. Nash.	14:12:'03 to 7:4:'04,	33†	14+	18+
Moy—Mr. G. Shannon, ..	23:3:'04 to 18:4:'04,	19	1	18
Nore—Major E. C. Hamilton,	30:11:'03 to 9:1:'04,	91	41	50
Owenea—Mr. J. A. Pomeroy, per Mr. H. Wilson.	23-24:12:'03, ..	67	33	34
Slaney—Mr. D. R. Pack-Beresford and Mr. R. W. Hall-Dare, per Mr. J. Sim.	27:2:'04 to 16:4:'04,	22	1	21
Suir—Mr. W. Rochfort and Lord Donoughmore, per Mr. J. Gearon.	5:2:'04 to 9:4:'04,	43	15	28
	Total, ..	1,164	399+	750+

* Sex not determined.

† Sex of one fish doubtful.

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1904-5.

RIVER.	Date of Marking.	Total No. Marked.	Number of	
			Males.	Females.
Bann—Mr. T. McDermott, ..	19-28:1:'05, ..	153	66	87
Blackwater (Lismore)—Mr. J. Penrose, per Mr. J. E. Godfrey,	7:11:'04 to 28:1:'05,	461	188	273
Blackwater (Meath)—Mr. R. S. Radcliffe,	12:2:'05, ..	1	1	—
Bush—Rev. William Ford-Hutchinson, Messrs. S. Doherty, and P. Tumulty.	21:1:'05 to 24:4:'05,	48	18	30
Caragh Lake—Messrs. F. J. Chute and J. Moriarty.	30:1:'05 to 4:4:'05,	72	26	46
Carrowmore Lake—Mr. Petrie, per Mr. P. Sheridan,	24:4:'05 to 6:5:'05,	6	1	5
Corrib—Mr. M. Lyden, ..	1:2:'05 to 6:3:'05,	15	7	8
Drumcliffe—Mr. Wm. C. Fair,	7:3:'05, ..	1	—	1
Erne—Mr. J. Swan, ..	16:12:'04 to 12:1:'05,	36	12	24
Foyle—Mr. T. McDermott, ..	19:11:'04 to 24:1:'05,	*100	18+	79+
Furnace Lake—Mr. H. M. Ankettell-Jones,	22:3:'05 to 14:4:'05,	†10	?	?
Invermore—Mr. J. Mason, ..	6-15:12:'04, ..	9	4	5
Killarney, Lower Lake and Rivers flowing into same—Lt.-Col. J. O'B. Drury and Mr. F. Meehan.	9:1:'05 to 4:4:'05,	31	9	22
Laune—Col. G. Nash, Messrs. R. Power and B. St. A. Jenner.	20:12:'04 to 30:3:'05,	28	7	21
Moy—Mr. R. L. Petrie, ..	27:3:'05 to 12:4:'05,	†2	?	?
Nore—Major E. C. Hamilton,	13:12:'04 to 28:1:'05,	26	12	14
Owenea—Mr. J. A. Pomeroy, per Mr. H. Wilson.	22:12:'04, ..	51	18	33
Roe and tributaries—Mr. J. Stevenson.	12:1:'05 to 28:3:'05,	5	4	1
Slaney—Messrs. D. B. Pack, Beresford, E. W. Bagnall and R. W. Hall-Dare, per Mr. J. Sim.	1:3:'05 to 20:4:'05,	30	11	19
Suir—Mr. W. Rochford and Lord Donoughmore, per Mr. J. Geeson.	1:2:'05 to 28:3:'05,	29	15	14
‡ Total, ..		1,114	417+	682+
GRAND TOTAL, 1902-1905, ..		3,328	1199+	2108+

* Includes two released before particulars were noted, and one not sexed.

† Sex not determined.

‡ Particulars of the marking of some fifteen fish in Caragh Lake and the River Dea were received after this paper had gone to press, and are not included.

RETURN OF CAPTURES OF MARKED SALMON.

TABLE I.

The Fish entered in this Return were marked after being stripped at Hatcheries, or as Slats taken after natural spawning.

For convenience of reference, the entries are made in numerical order of labels.

No. of Mark.	Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. In.				
5138A	5 0	2 2	Spent, .	Male, .	6 March, 1903,	R. Bush. Cutts.
	18 0	2 11	Clean, .		4 August, 1903,	R. Bann. Coleraine. Foyle and Bann Co.'s net.
6741A	4 0	1 11	Stripped,	Female,	24th Dec., 1901,	R. Erne. Cliff.
	13 0	2 8½	Clean, .		22nd May, 1903,	„ Ballyshannon.
42D	5 0	2 2*	Stripped,	Female,	24th Dec., 1901,	R. Erne. Cliff.
	14 0	2 10½	Clean, .		28th April, 1903,	„ Ballyshannon.
44D	5 0	2 1	Stripped,	Female,	24th Dec., 1901,	R. Erne. Cliff.
	12 0	2 9	Clean, .		5th May, 1903,	„ Ballyshannon.
804D	4 0	2 2	Stripped,	Female,	17th Dec., 1903,	Lower Lake, Killarney.
	11 0	2 7	Clean, .		8th Feb., 1905,	„ Marraha. Below Killorglin Bridge.
808D	3 8	2 2	Stripped,	Female,	17th Dec., 1903,	R. Flusk.
	13 0	2 8	Clean, .		14th Feb., 1905,	R. Lanne. Marraha. Below Killorglin Bridge.
1248D	5 0	2 1	Stripped,	Female,	18th Jan., 1902,	R. Foyle. Sion Mills.
	18 0	2 11	Clean, .		16th June, 1903,	„ 3 miles above Derry.
1258D	9 8	2 5	Stripped,	Female,	21st Jan., 1902,	Lower Lake, Killarney. Liberated 24th January, 1902.
	16 0	3 0	Clean, .		5th May, 1903,	R. Lanne. Marraha. Below Killorglin Bridge.

* Length of fish doubtful, it was either 24 or 26 inches.

TABLE I.

No. of Mark.	Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. In.				
1650D	6 8	2 6	Spent, .	Female,	11th March, 1904,	R. Swir. Neddins.
	17 7	2 11	Clean, .		15th Feb., 1905,	R. Barrow. New Ross Bridge.
1754D	4 0	2 1	Spent, .	Female,	2nd March, 1905,	R. Lunc. Beaufort.
	9 8	2 4½	Clean, .		12th July, 1905,	„ Estuary of.
1976D	4 8	2 2	Stripped	Female,	20th Dec., 1902,	R. Foyle. Sion Mills.
	10 0	2 6	Clean, .		5th August, 1903,	„ 1 mile below Derry.
2123D	4 0	2 0	Stripped,	Female,	17th Jan., 1903,	R. Erne. Cliff.
	7 0	2 3	Clean, .		25th June, 1903,	„ Ballyshannon.
*2142D	ca 6 0	2 3	Spent, .	Female,	2nd Feb., 1903,	Caragh Lake.
	14 0	—	Clean, .		18th July, 1903,	Castlemaine Hr. Cromane.
*2148D	ca 4 8	2 1	Spent, .	Male, .	2nd Feb., 1903,	Caragh Lake.
	18 0	3 0	Clean, .		8th April, 1904,	„ Gortnagsun.
2378D	4 0	2 1	Stripped,	Female,	18th Dec., 1902,	R. Bann. Portna.
	7 0	2 4	Clean, .		26th Oct., 1903,	R. Moyola. Castledawson Weir. (Marked again D3719).
2435D	6 0	2 4	Stripped,	Female,	2nd Jan., 1903,	R. Bann. Portna.
	9 0	2 6½	Clean, .		13th Aug., 1903,	„ New Ferry, about 8 miles above Killea Hatchery.
2439D	5 0	2 2	Stripped,	Female,	2nd Jan., 1903,	R. Bann. Portna.
	8 8	2 5½	Clean, .		15th Aug., 1903,	„ New Ferry, about 8 miles above Killea Hatchery.
2450D	5 0	2 3	Stripped,	Female,	2nd Jan., 1903,	R. Bann. Portna.
	10 0	2 6½	Clean, .		about 29th July, 1903.	„ New Ferry, about 8 miles above Killea Hatchery.
2504D	6 0	2 1	Stripped,	Male, .	29th Dec., 1902,	R. Owenna. Glenties.
	10 8	2 4	Clean, .		14th July, 1903,	Inver Bay. St. John's Point.

* Some doubt exists as to exact weight and length of fish at time of marking.

TABLE I.

No. of Mark.	Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. In.				
2522D	0 0	2 6	Stripped,	Female,	29th Dec., 1902,	R. Owenga. Glenties.
	14 8	2 10	Clean, .		9th July, 1903, .	" Estuary.
2760D	5 8	2 2	Stripped,	Female,	19th Jan., 1903,	R. Baun. Portna.
	10 8	2 7	Clean. .		25th Aug., 1903,	" New Ferry.
2820D	5 0	2 1	Stripped,	Female,	23rd Dec., 1903,	R. Owenga. Glenties.
	10 0	2 7	Clean, .		13th July, 1904,	" Estuary.
2834D	17 0	3 0½	Stripped,	Female,	23rd Dec., 1903,	R. Owenga. Glenties.
	21 0	3 3	Full, .		5th Dec., 1904, .	" Salmon trap on tributary of. Marked again D5059 and liberated 22/12/04.
2985D	5 0	2 3	Slat, .	Female,	17th Feb., 1903,	R. Bandon.
	—	—	Slat, .		21st March, 1903,	" ¼ mile above place of original capture.
3007D	4 0	2 3	Stripped,	Female,	13th Dec., 1903,	Erne. Cliff.
	5 12	—	Clean, ? .		9th June, 1904,	L. Erne. 8 miles above Bellock.
3057D	5 0	2 1	Slat(fairy well mended.)	Female,	14th March, 1903,	R. Lanes.
	ca 12 0	—	—		About 21st Feb., 1904.	R. Anascaul. Killed by an otter,
3090D	10 0	2 8	Slat, .	Male, .	28th March, 1903,	R. Slaney. Clohamon.
	—	—	Slat, .		16th April, 1903,	" 5 miles above. "

TABLE I.

No. of Mark.	Weight.	Length	Condition.	Sex.	Date	Locality, &c.
	Lbs. oz	Ft. In				
3094D	11 0 2 6	Slat, .	Male, .	23rd March, 1903,	R. Slaney. Clohamon.	
	27 0 3 7	Clean, . (fresh run)		17th May, 1904,	" Below Ennis- corthy. Borrmount.	
3462D	4 0 2 0	Stripped,	Female,	2nd Jan., 1904, .	R. Erne. Cliff.	
	— —	Grilse, .		End of June, 1904,	Gola Island. 7 miles North East of	
3487D	8 0 2 4	Stripped,	Female,	13th Jan., 1904,	R. Erne. Cliff.	
	9 8 2 6	Clean, .		11th July, 1904, .	" Channel of.	
3556D	8 0 2 5	Stripped,	Male, .	16th Dec., 1903, .	R. Lanne. Killorglin.	
	— —	Slat, .		5th Feb., 1904, .	" Fulda. Below Killorglin Bridge. $\frac{1}{2}$ mile above point where captured.	
3561D	5 0 2 1	Stripped,	Female,	29th Dec., 1903,	R. Lanne. Killorglin.	
	— —	Slat, .		3rd March, 1904,	" "	
3604D	4 0 2 1	Stripped,	Female,	1st Jan., 1904, .	R. Foyle. Sion Mills.	
4103D	15 0 3 3	Slat, .	Female,	28th March, 1905,	R. Slaney. Young's Bridge, Kildavin.	
	— —	Slat, .		26th April, 1905,	" Fairly well mended. "	
4104D	12 0 2 11 $\frac{1}{2}$	Slat, .	Male, .	28th March, 1905,	R. Slaney. Young's Bridge, Kildavin.	
	— —	Slat, .		26th April, 1905,	" Fairly well mended. "	
4296D	5 0 2 5	Stripped,	Female,	22nd Dec., 1904,	R. Owenea. Glenties.	
	11 0 2 8	Clean, .		7th July, 1905, .	" Estuary.	
4300D	3 8 1 10 $\frac{1}{2}$	Stripped,	Female,	22nd Dec., 1904,	R. Owenea. Glenties.	
—	7 0 2 0 $\frac{1}{2}$	Clean, .		4th July, 1905, .	" Estuary.	

* For details of reported capture see p. 42

TABLE I.

No. of Mark.	Weight.		Length	Condition.	Sex.	Date.	Locality, &c.
	Lbs.	oz.					
4503D	8	0	2 3	Stripped,	Female,	13th Dec., 1904, .	R. Nore. Arygal.
	—	—	—	Slat, .		9th March, 1905,	R. Nore-Barrow. Nw Ron
4532D	17	0	3 1	Slat, .	Male, .	5th March, 1905,	R. Slaney. Newlands.
	—	—	—	Slat, .		1st April, 1905, .	" dition improved. Coe
5052D	7	8	2 7	Stripped,	Female,	22nd Dec., 1904,	R. Owenes. Glenties.
	12	0	2 10	Clean, .		28th June, 1905,	" Estuary.
5068D	9	0	2 8	Stripped,	Female,	22nd Dec., 1904,	R. Owenes. Glenties.
	12	8	2 9½	Clean, .		7th July, 1905. .	" Estuary.
5210D	10	0	2 9	Stripped,	Male,	9th Jan., 1905, .	R. Fiesk.
	10	8	2 9	Slat, .		1st March 1905 .	R. Lanne. Mouth of.
5427D	2	0	1 7	Slat, .	Female,	21st Jan., 1905, .	R. Bush. Ashtree.
	—	—	—	Slat, .		31st Jan., 1905, .	" "
5528D	6	8	2 4	Stripped,	Male, .	20th Jan., 1905, .	R. Bann. Portua.
	7	0	—	Slat, .		11th Feb., 1905, .	" Near mouth of Potagh Burn, about 1½ miles up Bann. Found dead.

SECTION A.

Stripped Fish and Slats recaptured as Slats before reaching the Sea.

- *5528 D., BANN.—Male, marked 20th January, 1905, at Portna (Kilrea); 6 lbs. 8 oz.; 2 ft. 2 in.
Found dead at Potagh Burn, R. Bann (about $1\frac{1}{2}$ miles from the sea), on 11th February, 1905; 7 lbs.

I.

- *3561 D., LAUNE.—Female, marked at Killorglin, 29th December, 1903; 5 lbs., 2 ft. 1 in.
Recaptured at Killorglin, 3rd March, 1904.
- *3556 D., LAUNE.—Male, marked at Killorglin, 16th December, 1903; 8 lbs., 2 ft. 5 in.
Recaptured 5th February, 1904, at Pulta, below Killorglin Bridge, $\frac{1}{4}$ mile above point of original capture.
- *5210 D., FLESK.—Male, marked 9th January, 1905; 10 lbs., 2 ft. 9 in.
Recaptured 1st March, 1905, at the mouth of R. Laune; $10\frac{1}{2}$ lbs., 2 ft. 9 in.
- *4503 D., NORE.—Female, marked 13th December, 1904, at Arygal, R. Nore; 8 lbs., 2 ft. 3 in.
Recaptured 9th March, 1905, at New Ross, R. Nore-Barrow.
- 2985 D., BANDON.—Female, marked 17th February, 1903; 5 lbs., 2 ft. 3 in.
Recaptured 21st March, 1903, $\frac{1}{4}$ mile above place of original capture.

II.

- 3090 D., SLANEY.—Male, marked at Clohamon, 28th March, 1903; 10 lbs., 2 ft. 8 in.
Recaptured 16th April, 1903, 5 miles higher up.
- 4104 D., SLANEY.—Male, marked 28th March, 1905, at Young's Bridge, Kildavin; 12 lbs., 2 ft. $11\frac{1}{2}$ in.
Recaptured 26th April, 1905, at same place. (Fairly well mended.)
- 4103 D., SLANEY.—Female, marked 28th March, 1905, at Young's Bridge, Kildavin; 15 lbs., 3 ft. 3 in.
Recaptured 26th April, 1905, at same place. (Fairly well mended.)

* Fish stripped at a Hatchery.

4532 D., SLANEY.—Male, marked 5th March, 1905, at Newlands Fishery; 17 lbs., 3 ft. 1 in.
Recaptured 1st April, 1905, at Newlands.
(Condition improved).

5427 D., BUSH.—Female, marked 21st January, 1905, at Ash-tree, R. Bush; 2 lbs., 1 ft. 7 in.
Recaptured 31st January, 1905, at same place.

The records in this section fall into two divisions:—

- (i.) Fish recaptured in, or close to, tidal waters;
- (ii.) Those recaptured in upper waters.

The Bann record, D. 5528, may be omitted from both divisions. This fish was found dead after an interval of twenty-two days at the mouth of a small stream about $1\frac{1}{2}$ miles up the Bann reckoning from the sea.

It appeared to have increased 8 ounces in weight, but as the records were made by different persons, and the accuracy of country scales is not above suspicion, it is not desirable to press this point.

The beak of the under jaw is reported to have pierced the upper, and it seems quite justifiable to consider death as normal, and in no way due to the marking experiment.

i.—The Laune, Flesk, and Nore records being of hatchery fish stripped in the preceding winter, it is natural that the interval, which elapsed between marking and recapture, should be greater than in the case of fish marked and recaptured as slats.

The interval varies from fifty-one to eighty-six days, recapture occurring between the 5th of February and the 9th of March; the place is tidal water or within a short distance of tidal influence. It is impossible to say how much of this period was spent in fresh water proper, as from previous records it seems that the slat condition may continue for as long as 123 days (*vide* Holt, *op. cit.* p. 177, D. 4238). The weight was taken only in the case of D. 5210, which appeared to have increased 8 ounces in fifty-one days.

The Nore fish shows the longest interval between marking and recapture in the present records, viz., eighty-six days.

It must not be forgotten that these hatchery fish had, previous to liberation, been impounded for varying periods and then stripped, though these operations did not apparently produce any abnormal movements.

The Bandon fish D. 2985, a natural slat (female) of 5 lbs. weight, was taken on a fly, and captured for a second time on a live (trout) spinning bait. The interval between marking and recapture was thirty-two days (February 17 to March 21); the place of recapture was about a quarter of a mile up the river.

It seems possible that the fish may have been moving up and down with the tide, and its mode of capture would suggest that it was feeding, or anxious to feed.

ii.—The records in this division consist of four fish from the Slaney and one from the Bush. The latter may be conveniently treated of first, as the circumstances of its recapture are somewhat unusual. The fish was marked on the 21st January, 1905, and on the 31st of the same month was retaken, the hook fouling in the label, which had been placed in the dorsal fin. The place of recapture was the same pool as where marked.

The four fish from the Slaney were marked in March, so it is probable that some time had elapsed since they had rid themselves of their sexual products.

Their subsequent movements would, therefore, not be subject to the *nisus generativus*, though it may be objected that marking produced an abnormal condition.

Taking the records in order of time, 3090 D., a male slat 10 lbs. weight, marked on the 28th March, 1903, at Clohamon, was recaptured nineteen days later five miles higher up. Possibly this change of position is due to the disturbance caused to its natural habits by marking (*cf.* Calderwood quoted by Holt, see *op. cit.* p. 177).

The remaining three records from the Slaney, 4532 D., 4103 D., 4104 D., are of fish marked in March, 1905, and recaptured after intervals of twenty-seven to twenty-nine days in the same fishery, in two instances in almost the same spot.

The fish varied in weight from 12 to 17 lbs., or as clean fish would have scaled about 15 to 21 lbs., and their movements would appear to support the results of the Scottish Fishery Board's marking experiments, viz., that the heavier fish, as opposed, at any rate to grilse, spend a longer period in fresh water.

In some cases this might be ascribed to scarcity of water (*cf.* Archer*), but no such condition prevailed in these instances.

SECTION B.

Stripped Fish and Slat recaptured as Clean Fish during the following Summer in or at the mouth of the Rivers in which they were marked.

- *2435 D., BANN.—Female, marked at Portna (Kilrea), 2nd January, 1903; 6 lbs., 2 ft. 4 in.
Recaptured at New Ferry, 13th August, 1903; 9 lbs., 2 ft. 6½ in.

*11th Ann. Rep. Fish. Bd. Scot., Pt. II., p. 69.

* Fish stripped at a Hatchery.

- *2439 D., BANN.—Female, marked at Portna (Kilrea), 2nd January, 1903; 5 lbs., 2 ft. 2 in.
Recaptured at New Ferry, 15th August, 1903; 8½ lbs., 2 ft. 5½ in.
- *2450 D., BANN.—Female, marked at Portna (Kilrea), 2nd January, 1903; 5 lbs., 2 ft. 3 in.
Recaptured at New Ferry about the 29th July, 1903; 10 lbs., 2 ft. 6½ in.
- *2760 D., BANN.—Female, marked at Portna (Kilrea), 19th January, 1903; 5½ lbs., 2 ft. 2 in.
Recaptured at New Ferry, 25th August, 1903; 10½ lbs., 2 ft. 7 in.
- *2123 D., ERNE.—Female, marked at Cliff, 17th January, 1903; 4 lbs., 2 ft.
Recaptured at Ballyshannon, 25th June, 1903; 7 lbs., 2 ft. 3 in.
- *3007 D., ERNE.—Female, marked at Cliff, 13th December, 1903; 4 lbs., 2 ft. 3 in.
Recaptured in L. Erne, eight miles above Belleek, 9th June, 1904; 5½ lbs.
- *3487 D., ERNE.—Female, marked at Cliff, 13th January, 1904; 8 lbs., 2 ft. 4 in.
Recaptured in Erne Channel, 11th July, 1904; 9½ lbs., 2 ft. 6 in.
- *1976 D., FOYLE.—Female, marked at Sion Mills, 20th December, 1902; 4½ lbs., 2 ft. 2 in.
Recaptured one mile below Derry, 5th August, 1903; 10 lbs.; 2 ft. 6 in.
- *2522 D., OWENEA.—Female, marked at Glenties, 29th December, 1902; 9 lbs., 2 ft. 6 in.
Recaptured in the estuary of R. Owenea, 9th July, 1903; 14½ lbs., 2 ft. 10 in.
- *2820 D., OWENEA.—Female, marked at Glenties, 23rd December, 1903; 5 lbs., 2 ft. 1 in.
Recaptured in the estuary of R. Owenea, 13th July, 1904; 10 lbs., 2 ft. 7 in.
- *4296 D., OWENEA.—Female, marked at Glenties, 22nd December, 1904; 5 lbs., 2 ft. 5 in.
Recaptured in the estuary of R. Owenea, 7th July, 1905; 11 lbs., 2 ft. 8 in.
- *4300 D., OWENEA.—Female, marked at Glenties, 22nd December, 1904; 3½ lbs., 1 ft. 10½ in.
Recaptured in the estuary of R. Owenea, 4th July, 1905; 7 lbs., 2 ft. 0½ in.
- *5052 D., OWENEA.—Female, marked at Glenties, 22nd December, 1904; 7½ lbs., 2 ft. 7 in.
Recaptured in the estuary of R. Owenea, 28th June, 1905; 12 lbs., 2 ft. 10 in.

* Fish stripped at a Hatchery.

- *5058 D., OWENEA.—Female, marked at Glenties, 22nd December, 1904; 9 lbs., 2 ft. 8 in.
Recaptured in the estuary of R. Owenia, 7th July, 1905; 12½ lbs.; 2 ft. 9½ in.
- 2142 D., CARAGH LAKE.—Female, marked in Caragh Lake, 2nd February, 1903; ca. 6 lbs., 2 ft. 3 in.
Recaptured at Cromane (Castlemaine Hr.), 18th July, 1903; 14 lbs.
- 1754 D., LAUNE.—Female, marked 2nd March, 1905, at Beaufort, R. Laune; 4 lbs., 2 ft. 1 in.
Recaptured in the estuary of R. Laune, 12th July, 1905; 9½ lbs., 2 ft. 4½ in.

The records of female fish recaptured in the summer following marking amount in all to twenty-five since the commencement of the experiment. No river has more than eight recaptures to its credit, while some have two only; moreover, the records are spread over a number of years, and do not exceed four in number for any one river in a single season.

It is obvious, therefore, that any conclusions based on such insufficient data must be of a most provisional nature, and subject to many causes of error.

Amongst such causes the following may be cited:—

- (1.) That the recaptured marked fish in any year may not be representative of the general run of fish.
- (2.) That from the considerable difference in weights it is obvious that the fish differ in age; some, however, differ only slightly in weight, which would suggest that the rate of growth had varied before capture, and that this variation would possibly continue.
- (3.) That the increase may vary in different years owing to food supply and other causes.
- (4.) That as the place of recapture in the case of some of the fish is tidal water, and in the case of others fresh water, it is possible that we may be comparing fish which had definitely ceased feeding in the sea with those which would have continued to do so for some further period.

The apparent differences in the rate of growth in different rivers, as shown by the table below, must be taken for what they may be worth. It is plain that the variation in any one river is greater than can be demonstrated by a few records, and it is probable that while, in the case of the Owenia (see table) the series may be more or less complete, the Caragh records, even if correct, represent extreme limits.

* Fish stripped at a Hatchery.

FEMALE FISH MARKED AS SLATS OR STRIPPED FISH and re-captured as CLEAN in the Summer following marking.

River.	Number of Records.	Extremes of Increase on Slat Weight.		Increase in Length. Inches.	No. of Records from which Increase in Length is taken.
		Percentage.	Actual Increase in Lbs.		
Bann, . . .	6	50-100	3-5	2½-5	5
Caragh Lake, .	3	113-150	4½-9	7-9	2
Erne, . . .	4	19-75	1½-3	2-3	3
Foylo, . . .	2	120-122	5½-6"	4	2
Lane, &c., . .	2	75-138	2-5½	3½	1
Owenea, . . .	8	49-120	3½-6	1½-6	7

The figures on the table above also afford a provisional criterion by which we may judge, to some extent, of the previous history of fish which were recaptured in the second succeeding season (see on p. 33, *et seq.*, Sec. D.).

Thus, when we find there (Sec. D), records of Erne fish showing an increase in length of 8-9½ inches, and in weight 7-9 lbs. (140-220 per cent.), it seems safe to assume, from a comparison of these increases with those shown above, that we are dealing with fish whose period of feeding has been much prolonged, and the possibility of spawning in the winter preceding capture is almost excluded.

The Bann fish which are noted in this section were stripped for the Kilrea hatchery, and were liberated after marking between January 2nd and January 19th, 1903. They differed very little in weight and length, being 5 to 6 lbs., and 2 ft. 2 in. to 2 ft. 4 in. As full fish their weights would have been about 6 to 7½ lbs.

From the returns of fish marked in the Bann, these female fish would appear to be of about the average weight, and though not specifically described as grilse, their weights would incline one to place them in that category.

We have no knowledge of their movements immediately following marking; but if they were grilse it is probable that they rapidly descended; such, at least, would be in accordance with the Scottish marking experiments (*vide* Calderwood in *Brit. Field*, March 25, 1905).

The records of marked fish taken as slats in the Bann are not of much assistance, as the fish were males, and were found in a dead or dying condition after intervals of twenty-two to fifty-one days. We can therefore only judge of the subsequent

movements of these female slats by their condition on recapture, and from this it would appear that D. 2435, and D. 2439 either spent longer in fresh water or were less fortunate in their feeding grounds than D. 2760 and D. 2450, as these latter put on from $1\frac{1}{2}$ to 2 lbs. more in actual weight.

The interval, which elapsed between marking and recapture, is practically the same for all four records, being 208 to 225 days. When recaptured their weights ranged from $8\frac{1}{2}$ to $10\frac{1}{2}$ lbs., which would be about average weights for summer fish in the Bann.

The place of recapture, New Ferry, is some eight miles above Killybegs and twenty-five miles above Coleraine.

The Erne recaptures recorded above appear to differ in several respects from those in the Bann; most notably in the very small increase in actual weight made in the interval between marking and recapture.

D. 3487, a female stripped for the Belleek Hatchery, weighing 8 lbs. after stripping, was liberated on the 14th January, 1904, and recaptured 180 days later on the 11th July. The increase in weight was only $1\frac{1}{2}$ lbs. If the weight after stripping be increased by one-fifth, the original weight, as a full fish, would have been about 10 lbs., and it would therefore seem that the fish had not really increased at all, but merely recovered its condition.

D. 2123, a smaller fish, weighing after stripping only 4 lbs., was marked on 17th January, 1903, and recaptured on 25th June, 1903, an interval of 159 days. The weight, 7 lbs., on recapture, represents a net gain of over 2 lbs.

We know nothing at present as to the movements of individual spent fish in the Erne, as no recaptures of marked slats have been reported. It must also be remembered that the above records are of fish of two different summers, 1904 and 1903, and that we are not in a position to correlate the possible food supply and the condition of the fish.

Both these Erne fish were recaptured in tidal waters and the conclusions, suggested by Dr. Noel Paton* in his investigations of the factors determining the migration of salmon from sea to river, are, "that the salmon goes to sea to feed and returns to the river when it has accumulated its full store of nourishment, irrespective of the condition of the reproductive organs. The factor determining migration from sea to river is not the *nisus generativus*, but the state of nutrition."

If these conclusions are correct there is some doubt as to whether D. 3487 was meditating the ascent when recaptured, or would not have continued to feed for some further period before entering fresh water, though the condition of D. 3007 (see below) would rather support the former view.

D. 3007 falls into a different category, as the place of recapture was not tidal water, but about eight miles above Belleek,

*18th Ann. Rep. Fish. Bd. Scot., Pt. II., pp. 78 et seq.

on Lough Erne. The fish was a female stripped at the hatchery (Belleek) and liberated in December, 1903, weight 4 lbs., and was taken on a cross line, after 179 days, on 9th June, 1904, weighing 5 lbs. 12 oz.; this would represent an increase of about $\frac{3}{4}$ lb. on the weight before stripping.

Though in poor condition the fish does not appear to have been a slat. Further recaptures of summer fish in the fresh waters of the Erne will be required before it is possible to say whether we are dealing with a normal condition or not.

It may be remarked that while the actual physiological condition of fish entering rivers seems to require further attention, reports of fishery owners place beyond doubt the existence of considerable variation in the marketable condition.

Poor quality is especially noticed amongst grilse in years of short supply, and perhaps attracts less attention when a large take produces a satisfactory balance sheet.*

There is also the possibility that such lean grilse would not remain in the river through winter, and in some cases scarcely follow their fatter brethren beyond the estuary.

D. 1976, Foyle, the only fresh record in this river appears to be normal as compared with previous recaptures. This hatchery fish weighed, after stripping, in December, 1902, $4\frac{1}{2}$ lbs., and on recapture on 5th August, 1903 (228 days), 10 lbs. It had thus increased $5\frac{1}{2}$ lbs. (122 per cent.) in weight, and in length 4 inches.

Previous records (*vide* Holt, *op. cit.*, p. 179, D. 1250) show that an increase of 4 inches and 6 lbs. (120 per cent.) can be made in 185 days, so that we should probably allow some time for the fresh water habitat in the case of 1976 D.

The recaptures in the Owenea are eight in number, and two of these are referred to different sections, being "captures at sea" and "annual spawner."

The remaining six records are of fish taken in nets in the estuary of the Owenea in the June or July following marking.

The interval between marking and recapture varies from 188 to 203 days; the increase in weight from $3\frac{1}{2}$ to 6 lbs., and in length from $1\frac{1}{2}$ to 6 inches.

As these recaptures took place in the estuary it is hardly possible to say definitely whether the fish were seeking fresh water or not.

The increase in weight from slat condition is, however, quite compatible with the intention of a stay in fresh water; as D. 164, which was recaptured on a fly and has already been recorded (Holt, *op. cit.* p. 179) showed an increase of only $4\frac{1}{2}$ lbs., or 50 per cent. increase on its weight as a slat.

D. 2142, Caragh Lake, represents among the present records the greatest increase in weight in fish recaptured in the summer following marking. The fish, a spent female, weighing 6 lbs., and marked on the 2nd February, 1903, in Caragh

**Cf. also Irish Inland Fish. Commission Rep., 1901, p. 127.*

Lake, was recaptured at Cromane (Castlemaine Harbour) on the 18th July following, after an interval of 166 days, weighing 14 lbs., an increase of 133 per cent.

Though there is some slight doubt as to the accuracy of the return of fish marked at Caragh, there is little doubt but that the fish marked with label D. 2142 was of 6 lbs. weight or under.

The increase in weight is large, but it is supported by previous records from the same place, though it must be admitted that the accuracy of these records did not pass entirely unquestioned (*vide* Holt, *op. cit.*, p. 180).

1754 D., Laune, was a natural slat when marked, and from the date of marking (2nd March) it is likely that it would soon have reached salt water (*cf.* 3561 D., &c., Sec. A.).

Its weight was 4 lbs., and length 2 ft. 1 in., and when recaptured in the estuary of the Laune on 12th July following (132 days), it scaled 9½ lbs., and measured 2 ft. 4½ in.

The increase in weight (5½ lbs.) represents 138 per cent. on the slat weight, and over 100 per cent. on the estimated clean weight of the preceding year.

SECTION C.

Stripped Fish recaptured during the following Close Season.

*2378 D. BANN.—Female, marked at Portna (Kilrea), 18th December, 1902; 4 lbs., 2 ft. 1 in.

Recaptured at Castledawson Weir, R. Moyola, 26th October, 1903; 7 lbs., 2 ft. 4 in.

*2834 D., OWENEA.—Female, marked at Glenties, 23rd December, 1903; 17 lbs., 3 ft. 0½ in.

Recaptured at the salmon trap, R. Owenea, 5th December, 1904; 21 lbs., 3 ft. 3 in.

The two records given above of fish taken in the close season following marking are somewhat dissimilar.

D. 2378, Bann, a stripped female grilse (?) marked on 18th December, 1902, weight 4 lbs., length 2 ft. 1 in., was recaptured at Castledawson Weir, River Moyola, on 26th October, 1903, weight 7 lbs., length 2 ft. 4 in.

From its weight and length it would appear to be similar to D. 2435, 2499, &c., which were recaptured in the summer following marking (*see* p. 26, *et seq.*).

The weight on recapture, if reduced by one-fifth, would show a net increase of about 1½ lbs. from slat to slat, which is in line with previous records of annual spawning (*cf.* Holt, *op. cit.*, p. 182, D. 4456 Foyle).

* Fish stripped at a Hatchery.

It is probably safe to class this fish as an instance of annual spawning, for a somewhat similar case occurred at Lismore, where a fish which showed no sign of spawn on the 30th October, was fully ripe on the 5th December following (*vide ibid.* p. 192).

D. 2834, a female fish of 17 lbs., and 3 ft. 0½ in., was stripped at the Glenties hatchery in December, 1903. It was recaptured in December following, and weighed when "full," before stripping, 21 lbs., and measured 3 ft. 3 in.

When stripped its weight was 17½ lbs. In this case we are dealing with a salmon, not a grilse, and, possibly, of a fish approaching its maximum weight, as from an examination of the fish marked in this river since the winter of 1899, this weight (17½ lbs. as stripped fish) is not exceeded except in one or two instances and then only by a few pounds. It may be that the larger fish seek other waters more suitable to their size, or that the local conditions are against their chances of living to reach a larger size.

The increase (8 oz.) is the least among our Irish recaptures up to the present, but the records are all for small fish.

Calderwood* quotes a record, 7355, which in regard to increase in weight is precisely similar. The fish was a female of 13 lbs.; there was, however, no increase in length, while the Owenea record shows an increase of 2½ inches.

* 22nd Ann. Rep. Fish. Bd., Scotland, Pt. II., p. 94.

SECTION D.

Stripped Fish and Slat recaptured as Clean Fish in the Rivers in which they were marked, in the second succeeding Fishing Season.

*1258 D., LOWER LAKE, KILLARNEY.—Female, marked 21st January, 1902; 9½ lbs., 2 ft. 5 in.

Recaptured at Marraha, below Killorglin Bridge, 5th May, 1903; 16 lbs., 3 ft.

*804 D., LOWER LAKE, KILLARNEY.—Female, marked 17th December, 1903; 4 lbs., 2 ft. 2 in.

Recaptured at Marraha, below Killorglin Bridge, 8th February, 1905; 11 lbs., 2 ft. 7 in.

*808 D., FLESK.—Female, marked 17th December, 1903; 3½ lbs., 2 ft. 2 in.

Recaptured at Marraha, below Killorglin Bridge, 14th February, 1905; 13 lbs., 2 ft. 8 in.

*1248 D., FOYLE.—Female, marked at Sion Mills, 18th January, 1902; 5 lbs., 2 ft. 1 in.

Recaptured three miles above Derry, 16th June, 1903; 18 lbs., 2 ft. 11 in.

* Fish stripped at a Hatchery.

- *6741 A., ERNE.—Female, marked at Cliff, 24th December, 1901; 4 lbs., 1 ft. 11 in.
Recaptured at Ballyshannon, 22nd May, 1903; 13 lbs., 2 ft. 8½ in.
- *42 D., ERNE.—Female, marked at Cliff 24th December, 1901; 5 lbs., 2 ft. 2 in.†
Recaptured at Ballyshannon, 28th April, 1903; 14 lbs., 2 ft. 10½ in.
- *44 D., ERNE.—Female, marked at Cliff, 24th December, 1901; 5 lbs., 2 ft. 1 in.
Recaptured at Ballyshannon, 5th May, 1903; 12 lbs., 2 ft. 9 in.
- 2149 D., CARAGH LAKE.—Male, marked 2nd February, 1903; ca. 4½ lbs., 2 ft. 1 in.
Recaptured at Gortnagaun, Caragh Lake, 8th April, 1904; 18 lbs., 3 ft.
- 3094 D., SLANEY.—Male, marked 29th March, 1903, at Clohamon; 11 lbs., 2 ft. 6 in.
Recaptured at Borrmount, below Ennis-corthy, 17th May, 1904; 27 lbs., 3 ft. 7 in.

Since the publication of the last Report, in which two cases appeared of fish recaptured in the second succeeding fishing season, thirteen new instances have been recorded; four of these are treated of in the sections following (see p. 39, *et seq.*), as recapture took place in rivers other than those in which the fish were originally marked.

What the history of the fish may have been from the time of marking and liberation until recapture can only be conjectured from the condition of the fish on recapture, and in considering this it is necessary to have regard to the increase in weight and length as shown by the summer fish, and those which are known to have spawned in two successive seasons.

Here it may be convenient to repeat in a different form the particulars, which are summarised on p. 29, and which show the varying increase in weight, in a single season, of female fish of different initial weights.

The instances of annual spawning are also included here; the Caragh Lake records are retained, though it is inadvisable to attach too much importance to them, as there is reason to suspect their accuracy.

The majority of the Irish records being for small fish, I have tabulated some Norwegian records by Archer, of fish marked in the Sand's and Aensira Rivers (*vide op. cit.*, p. 67) and recaptured in or at the mouth of these rivers.

* Fish stripped at a Hatchery.

† Length appears to have been either 2 ft. or 2 ft. 2 in.

INCREASE IN WEIGHT OF FEMALE FISH of different initial weights in a single season.

River.	Weight as Slat or Stripped Fish.	Weight as Clean Fish.	Increase per cent. on initial Slat Weight.
Erne,	4 lbs.	5½ lbs.	44 per cent.
	4 "	7 "	75 "
	6 "	8 "	33 "
	8 "	9½ "	19 "
Bann,	4 lbs.	7½ lbs.	81 per cent.
	4 "	7 "	75 "
	4½ "	7½ "	78 "
	5 "	10 "	100 "
	5½ "	10½ "	91 "
	5 "	8½ "	70 "
Foye,	4½ lbs.	10 lbs.	122 per cent.
	5 "	11 "	120 "
Owens,	3½ lbs.	7 lbs.	100 per cent.
	5 "	11 "	120 "
	5 "	10 "	100 "
	6 "	12 "	100 "
	7½ "	12 "	60 "
	9 "	12½ "	39 "
	9 "	13½ "	50 "
	9 "	14½ "	61 "
Laune,	ca 3½ lbs.	6 lbs.	ca 75 per cent.
	4 "	9½ "	138 "
Caragh Lake, . . .	4 lbs.	8½ lbs.	113 per cent.
	6 "	15 "	150 "
	6 "	14 "	133 "
Sand's River, . . .	12 lbs.	18½ lbs.	54 per cent.
	13 "	20 "	54 "
	13 "	18 "	38 "
	15½ "	20½ "	32 "
	17½ "	23 "	31 "
	19 "	27½ "	45 "
	19½ "	24 "	23 "
Aensira River, . . .	8 lbs.	15 lbs.	88 per cent.
	13½ "	16½ "	25 "
	13½ "	21 "	58 "
	14½ "	20½ "	44 "

The weights of the Sand's and Aensira fish are in some cases estimates; thus, some of the fish being marked as clean or full fish, the slat weight has been arrived at by reducing this weight by one-fifth.

The general conclusion, which may be drawn from these figures, is that, as regards increase in weight of fish of different initial weights in a single season, the rate of increase tends to vary inversely as the initial weights; the increment in all cases being expressed as a percentage on the slat weight.

The limits of variation of fish of the same weight are probably large, but the number of records is insufficient for a settlement of this question. In the Owenea records the dependence of the rate of increase on the initial weights is very clearly brought out. The Norwegian records show that only in the case of the fish of 8 lbs. did the increase exceed 70 per cent. The Scottish records also point to the same general conclusions (*vide* Calderwood, *op. cit.*).

Bearing these figures in mind, it seems safe to say that, though a fish may increase by a large percentage on its slat weight in a single season, it will not in the subsequent season continue to increase at the same rate; the increase per cent. on slat weight falling rapidly after a certain stage has been reached. This circumstance does not appear to have received, in previous computations of rate of growth, the attention which it deserves.

Several of the long migration fish exhibit an increase which is approximately double that made by short migration fish of similar weight, yet having regard to the rate of increase as shown above, it cannot be upheld that the two classes differ only by the date of capture, and that the additional increase may be put down to the longer interval between marking and recapture.

Moreover, as regards the long migration fish, it must be remembered that, though captured in the second succeeding season, the date is early and the fish are either spring or early summer fish. Recovery from spawning in the preceding winter at so early a date, and with so large an increase in weight and length, is most improbable.

I am, therefore, of the opinion that, with possibly one exception, the records in this section are of fish which, though they may have visited fresh water in the interval between marking and recapture, made no long stay, and did not spawn in the winter preceding recapture.

D. 1258, Lower Lake, Killarney (Laune), is perhaps a doubtful instance; a hatchery fish, liberated on 21st January, 1902, weighing 9½ lbs. and measuring 2 ft. 5 in., it was recaptured on the 5th May, 1903—an interval of 469 days—weighing 16 lbs. and measuring 3 ft. The increase in length is 7 inches, and in weight 6½ lbs. (68 per cent.) on its original measurements as a slat. Previous recaptures of Laune fish are hardly comparable with D. 1258, as the weights of the fish, when liberated, did not exceed 5 lbs. It is, however, quite possible, having regard to the small increase shown by the records of Laune fish recaptured in 1902, in the summer following marking, that the increase in weight of 6½ lbs. of D. 1258 may be normal; nor is it probably outside the range of variation which may be held proved after more evidence.

Recaptures of Laune fish, while still slats, show that this condition may continue for as long as 123 days; it is possible, therefore, that the period between marking and recapture should be considerably reduced to arrive at the time spent by D. 1258 in salt water.

We have two other records from this watershed, viz.:—D. 804, Lower Lake, Killarney, and D. 808, Flesk. Both fish were liberated on the same day, 17th December, 1903, were the same length, 2 ft. 2 in., and practically the same weight, 4 lbs. and 3½ lbs.

They were recaptured on the 8th and 14th February, 1905, at Marraha, below Killorglin Bridge (River Laune). The increase on their (stripped) weight is, respectively, 7 and 9½ lbs., and in length 5 and 6 inches; if expressed as a percentage the increase in weight is 175 and 271 per cent.

Summer recaptures of fish of this weight show an increase of from about 70 to 138 per cent., and, having regard to the early date of capture, it may be fairly assumed that the fish in question did not mature sexual products in the winter preceding recapture.

D. 1248, Foyle, was recaptured after an interval of 514 days, being marked on the 18th January, 1902, and recaptured 16th June, 1903. It had increased 10 inches and 13 lbs., or 260 per cent., during this period. This record, taken in conjunction with that of D. 1250, noted in the previous Report, affords a good example of the duality of migration.

For convenience of comparison the details are repeated:—

SHORT MIGRATION.*				
			Lbs.	Ft. In.
D. 1250,	Female,	18th January, 1902,	5	2 1
		22nd July, 1902, . .	11	2 5
Interval between marking and recapture—185 days.				
LONG MIGRATION.*				
			Lbs.	Ft. In.
D. 1248,	Female,	18th January, 1902,	5	2 1
		16th June, 1903, . .	18	2 11
Interval between marking and recapture—514 days.				

* The terms short and long migration are used by Calderwood to distinguish between the fish returning in the summer or as spawners in the autumn or early winter of the year of descent as kelts, and the clean winter or spring fish. See 22nd Ann. Rep. Fish. Bd., Scot., Pt. II., p. 86.

Both fish were recaptured at approximately the same place, viz., one and three miles above Derry.

The Erne fish recorded in this section would seem to be undoubtedly examples of the long migration habit; a reference to p. 35 will show that the greatest increase in weight up to the present recorded of fish captured in the Erne in the summer following marking is 75 per cent., while it may fall as low as 19 per cent.

The increase in D. 44, D. 42, and A. 6741, varies from 7 to 9 lbs., 140 to 224 per cent., and in length from 8 to 9½ inches.

These three fish, females, were stripped for the hatchery and liberated on the 24th December, 1901; the interval between marking and recapture was 490 to 514 days (April 28th to May 22nd). The place of recapture, Ballyshannon, is tidal water, so that it is possible that the fish had not finished feeding.

The early date of capture of D. 42, on April 28th, is noticeable.

The Caragh Lake record shows the greatest increase per cent. up to the present recorded of fish recaptured in the second succeeding season. D. 2149, a male of 4½ lbs., marked on the 2nd February, 1903, was retaken in Caragh Lake after an interval of 431 days, weighing 18 lbs. The increase is 300 per cent. on the slat weight. This record may be compared with D. 2142, given on page 28, as showing the increase in weight, &c., of fish having the short and long migration habit, though the comparison is, to some extent, nullified by the fish being of different sexes.

SHORT MIGRATION.

		Lbs. oz.	Ft. In.
D. 2142, .	2nd February, 1903, .	6 0	2 3
Female, .	18th July, 1903, . . .	14 0	—

Interval between marking and recapture—166 days.

LONG MIGRATION.

		Lbs. oz.	Ft. In.
D. 2149, .	2nd February, 1903, . .	4 8	2 1
Male, .	8th April, 1904, . . .	18 0	3 0

Interval between marking and recapture—431 days.

It may be objected that as D. 2142 was recaptured at Cro-mane, Castlemaine Harbour, it was not necessarily seeking fresh water, and is not an example of the "short migration" habit. There is, however, another record, D. 1422, noted in last Report. This fish was marked on 3rd February, 1902,

and was retaken in Caragh Lake on the 24th June following, with an increase of 9 lbs., or 150 per cent. This increase was regarded (*vide* Holt, *op cit.*, p. 180) as unusually large, and was, indeed, the largest among the records up to date for summer fish.

A casual examination of the two records, D. 1423, and D. 2149, might lead one to suppose that the additional increase in the case of the latter could be accounted for by the greater interval which elapsed between marking and recapture; but this, as I have already attempted to show (see p. 36) is most improbable, having regard to the general rate of increase and to the early date of recapture.

The Slaney fish, D. 3094, a natural male slat, marked at Clohamon, March 29th, 1903, of 11 lbs. weight and 2 ft. 6 in. in length, was recaptured in nets at Borrmount, about five miles below Enniscorthy, on 17th May, after an interval of 415 days. The increase in weight was 16 lbs., and in length 13 inches. This is the greatest increase in actual weight and length recorded up to the present, though D. 2149, Caragh Lake, shows a greater increase *per cent.* on slat weight. The increase of 16 lbs. also appears to be greater than that of any fish recorded by the Scottish Fishery Board.

The inspector of bailiffs of the district was present when the fish was taken, and it is described as "fresh run" with sea lice still attached.

There are no records of fish recaptured in the Slaney in the summer following marking, and there is, therefore, no comparison possible with this case. Having regard, however, to the large increase in weight and length, it seems safe to place this record, provisionally at least, among the fish showing the long migration habit.

SECTION E.

Fish captured in Rivers other than those in which they were marked.

3057 D., LAUNE.—Female, marked 14th March, 1903; 5 lbs., 2 ft. 1 in.

Found dead (killed by an otter) in R. Anascaul, 21st February, 1904; estimated weight, 12 lbs.

1650 D., SUIR.—Female, marked at Neddins, River Suir, 11th March, 1904; 6½ lbs., 2 ft. 6 in.

Recaptured at New Ross Bridge, River Barrow, 15th February, 1905; 17 lbs. 7 oz., 2 ft. 11 in.

5138 A., BUSH.—Male, marked Cutts, R. Bush, 16th March, 1903; 5 lbs., 2 ft. 2 in.

Recaptured in Foyle and Bann Co.'s net at Coleraine, 4th August, 1905; 18 lbs., 2 ft. 11 in.

D. 3057, Laune, marked on the 14th March, 1903, a natural slat of 5 lbs., and 2 ft. 1 in., was, after an interval of 344 days, found dead (killed by an otter) in the River Anascaul. Its weight was estimated at 12 lbs., which would equal an increase of about 140 per cent. on its slat condition. The Anascaul, or Owenascaul, is a small river flowing into Dingle Bay about fifteen miles from the Laune, and seawards of it. I am not acquainted with details as to the distance up the river at which the fish was found, and there is nothing to show whether a change of spawning habitat was meditated or not.

D. 1650, Suir, affords a parallel case, as regards habit, to A. 6290 (*vide* Holt, *op. cit.*, p. 183). Taken together, they would appear to be further examples of divided migration habit, i.e., from slat to summer fish, and slat to spring salmon.

D. 1650, a rod-caught slat marked at Neddin's Water, River Suir, 11th March, 1904, weighing $6\frac{1}{2}$ lbs. and measuring $2\frac{1}{2}$ ft., was recaptured on the 15th February, 1905 (an interval of 341 days), weighing 17 lbs. 7 oz. and measuring 2 ft. 11 in. The increase in weight, 10 lbs. 15 oz., is equivalent to 168 per cent. on the slat weight. The change in weight of A. 6920 was so slight, only $\frac{1}{4}$ lb. increase on slat weight, that it seems probable that it had, as suggested (*vide* Holt, *ibid.*), not yet finished feeding, or else was abnormal.

These records of Suir fish recaptured in the tidal portion of the Barrow are not examples of undoubted change of river, as they may not have intended to enter the fresh-water portion of the Barrow, which has a common estuary with the Suir and Nore; the records may, however, point to a habit in the Suir fish which further evidence may substantiate.

The Bush record affords an example of an undoubted change of river, though possibly only of a temporary nature.

A. 5138, a male kelt, weight 5 lbs., length 2 ft. 2 in., was marked at the Cutts, River Bush, on the 16th March, 1903; when recaptured on the 4th August, 1905, near Coleraine, R. Bann, it weighed 18 lbs., and measured 2 ft. 11 in.

Dealing first with the change of river, it may be noted that this record is not quite parallel to that of D. 1650, Suir, as this latter fish, though recaptured in the Barrow, was taken in the tidal portion of that river, which has a common estuary with the Suir, while the mouths of Rivers Bann and Bush are some ten miles apart.

Similar change of river has, however, been recorded by Calderwood* in Scotland, where fish marked in the Helmsdale have been retaken in the Brora, the distance between the mouths of the two rivers being about twelve miles.

The Bush fish was recaptured in the Foyle and Bann Company's net at Coleraine, which is some miles up the River Bann. This indicates an undoubted change of river; a further short ascent would have brought the fish out of the tideway into fresh-water proper.

It is somewhat difficult to decide whether such change of river is to be regarded as of a temporary or permanent nature.

* 20th Ann. Rep. Fish. Bd., Scot., Pt. II., p. 75.

I am inclined to regard it as temporary on account of the difference which is said to exist between the fish of the Rivers Bann and Bush. It is alleged that the former are deeper fish and can be recognised when taken in the Bush. Evidence to this effect was given before the Inland Fisheries Commission in 1899.* It is generally held that such differences do exist between the fish from different rivers, though the matter has never been treated scientifically; the belief is supported by the recapture of a marked fish which has already been recorded (*vide* Holt, *op. cit.* p. 181); this fish was sold by a London fishmonger, who, without knowledge of its origin beyond the fact that it had come from Ireland, identified it correctly as a Bann fish from its general appearance.

On the other hand, the Foyle and Bann Co.'s representative at Coleraine did not, when reporting the capture of A. 5138, Bush, make any suggestions as to its origin. If such characteristic differences do exist between the fish from the Bann and Bush, it seems probable that the number of Bann fish which find their way to the Bush, and *vice versa*, must either be very small or else their visit must be of a temporary nature; otherwise it seems probable that such characteristic differences would disappear in course of time.

But it may be objected that these differences do not exist, or if they do, that they are induced by the environment of the salmon prior to its first descent to the sea.

The movements of A. 5138 from the time it was marked in the Bush until its recapture some sixteen months later, can only be conjectured. The fish may have milted in the winter of 1904, or, on the other hand, may not have entered any river until its recapture in August, 1905.

The only guide to its past history lies in the weight of the fish at the time of recapture as compared with its weight when marked as a slat. When a number of records from a river have been obtained, this affords a fair criterion, and enables one to place the fish amongst the short or long migration class. Unfortunately, no Bush fish have been recaptured in the summer following marking, the only record being of a fish taken in May without apparently having fully recovered its condition (*vide* Holt, *op. cit.*, p. 179).

The records of marked fish from other rivers are no certain guide, as it seems probable that the rate of increase varies in different rivers (*cf.* p. 35); further, A. 5138 is male fish, and the experiment up to the present would suggest that the movements and probably the rate of increase of the two sexes may differ.

I am, however, inclined to place the Bush fish amongst those which show the long migration habit, as the increase on slat weight amounts to 260 per cent., with a correspondingly large

* *Irish Inland Fish. Com. Rept.*, 1901. Evidence of Dr. Traill. Q. 3986 [Cd. 448].

increase in length. The Caragh Lake record D. 2149 (see p. 38) offers a very similar increase in weight and length. It must be remembered that the Caragh Lake fish was recaptured early in the year, and the date of capture, when read in conjunction with the large increase, practically excluded the possibility of the fish having spawned in the winter preceding recapture. The date on which the Bush fish was recaptured (August 4th) leaves this point doubtful.

I have purposely omitted from the list above and from Table I. the details of a Foyle fish which is reported as recaptured in the River Laune, and while it is unnecessary to disclaim any intention of questioning the good faith of the gentleman who is responsible for the record, there is at least a possibility of error. The nature of the record is such that conclusive evidence would be required to support it.

As details have been published in the *Field* of June 10th, 1905, it is necessary to set forth somewhat fully the circumstances. A label, D. 3604, was placed in a Foyle fish of 4 lbs. weight in January, 1904; in April, 1905, a gentleman, rod-fishing in the River Laune (Killarney), took a spent fish, bright and well mended, and bearing, as he stated, the above-mentioned label.

The gentleman had himself marked some spent fish in the previous March, and amongst the labels used was D. 3064. The label (D. 3604) was not removed, and it is obvious that the figures of the two labels are most liable to be confused. The weight of the fish marked with D. 3064 is given as 5 lbs., and length as 26½ inches, while the *estimated* weight and length of the recaptured slat were 7 lbs. and 30 inches. Under the circumstances it seems advisable to place the record on one side as doubtful, and to await further evidence before using it as a proof of the migration and spawning of fish in rivers other than their own.

SECTION F.

Marked Fish Recaptured at Sea.

- *2504 D., OWENEA.—Male, marked at Glenties, River Owenea, 29th December, 1902; 6 lbs., 2 ft. 1 in.
Recaptured at St. John's Point, Inver Bay, 14th July, 1903; 10½ lbs., 2 ft. 4 in.
- *3462 D., ERNE.—Female, marked at Cliff, River Erne, 2nd January, 1904; 4 lbs., 2 ft.
Recaptured seven miles north-east of Gola Island at the end of June, 1904.

The Owenea and Erne fish mentioned above are the only records up to the present reported of fish recaptured at sea at a distance from the rivers in which they were marked.

* Fish stripped at a Hatchery.

D. 2504, Owenea, marked after stripping at Glenties Hatchery on the 29th December, 1903, was liberated weighing 6 lbs. and measuring 2 ft. 1 in. On the 14th of July following it was recaptured at St. John's Point, Inver Bay, weight 10½ lbs. (an increase of 75 per cent. on the slat weight). The place of recapture is about thirty to forty miles from the Owenea. The fish possibly may have been following the coast line, or may have been to sea and struck land at this point; it was probably still feeding, though its weight does not differ greatly from that of fish taken in the estuary. It is the first male (marked) fish from the Owenea that has been recaptured and reported. It is perhaps suggestive of a difference in habits between the two sexes.

The Erne fish, D. 3462, which was recaptured at sea, had travelled at least sixty or seventy miles from the place of marking in about six months.

We have no details of this capture beyond the facts that the date was about the end of June following marking, and the place about seven miles N.E. of Gola Island (not far from Gweedore). A large number of salmon are caught in drift nets along the north and north-west coasts; the fishing, which takes place about June, lasts only five or six weeks, and usually extends to a distance of six miles from land (*vide* p. xxii., Report, Sea and Inland Fisheries of Ireland, 1903, Pt. I.).

From reports received by the inspectors it would appear that the fishing may extend as far as eighteen miles seawards of Aranmore.

The number of recaptures of marked fish at sea is too small to allow of theories as to the source of supply; from the Owenea record a southerly migration from the river seems indicated, while the Erne fish went north.

TABLE II.

Fish marked at Lismore Weir and Recaptured.

No. of Mark.	*Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. In.				
2214D	12 0	2 3	Spent,	Female,	15th Nov., 1902,	R. Blackwater. Lismore Weir.
	10 0	—	do.		18th Feb., 1903,	R. Blackwater. Killbree. 2½ miles down. Found dead.
2252D	6 0	2 0	Spent,	Female,	27th Nov., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		—	R. Blackwater. Found dead, a few days after marking, killed and partly eaten by an otter.
2304D	10 0	2 4	Spent,	Male,	6th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		—	R. Blackwater. Lismore Weir. Killing hatch. A few days later.
2307D	6 0	2 0	Spent,	Female,	6th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		—	R. Blackwater. Lismore Weir. Killing hatch. A few days later.
2315D	6 0	2 0	Spent,	Male,	6th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		—	R. Blackwater. Lismore Weir. Killing hatch. A few days later.
2333D	8 0	2 2	Spent,	Male,	10th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		20th Dec., 1902,	R. Blackwater. Glenmore Glen. 5 miles up. Found dead, killed by an otter.
2572D	9 0	2 3	Spent,	Male,	13th Dec., 1902,	R. Blackwater. Lismore Weir.
	(8 0)	—	do.		8th Jan., 1903,	R. Blackwater. Tourin. 6 miles down. Found dead and partly eaten.
2606D	8 0	2 2	Spent,	Male,	18th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		End of Feb., 1903,	R. Blackwater. Youghal. 20 miles down. Found dead.
2641D	9 0	2 3	Spent,	Male,	23rd Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		End of Feb., 1903,	R. Blackwater. Youghal. 20 miles down. Found dead.

* NOTE.—The weights of spent (stripped) fish are throughout estimated only, those of clean fish when marked are also estimated, but on recapture the clean fish were weighed. The lengths of all fish are from actual measurements.

TABLE II.

No. of Mark.	Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Fl. In.				
2642D	16 0	3 0	Spent,	Male,	23rd Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do,		19th Feb., 1903,	R. Blackwater. Salter-bridge. 2½ miles down. In nets.
2667D	12 0	2 8	Spent,	Male,	29th Dec., 1902,	R. Blackwater. Lismore Weir.
	—	—	do.		6th Feb., 1903,	R. Blackwater. Glenmore Stream. 3½ miles up. Found dead.
2668D	12 0	2 6	Clean,	Female,	24th Dec., 1902,	R. Blackwater. Lismore Weir.
	13 0	2 6	do.		12th May, 1903,	R. Blackwater. Fort Grady. 40 miles up. Killed on red.
2872D	12 0	2 6	Clean,	Female,	24th Dec., 1902,	R. Blackwater. Lismore Weir.
	12 0	2 7½	do.		18th May, 1903,	R. Blackwater. Fort Grady. 40 miles up. Killed on red.
2878D	6 0	2 0	Spent,	Male,	1st Jan., 1903,	R. Blackwater. Lismore Weir.
	5 0	—	do.		20th Jan., 1903,	R. Blackwater. Lismore Hatchery.
2884D	18 0	2 8	Spent,	Male,	1st Jan., 1903,	R. Blackwater. Lismore Weir.
	15 0	—	do.		24th Feb., 1903,	R. Blackwater. Tragten. 2 miles down. Taken in nets. Subsequently died.
2891D	16 0	2 11	Spent,	Female,	1st Jan., 1903,	R. Blackwater. Lismore Weir.
	—	—	do.		End of Feb., 1903,	R. Blackwater. Ardsallagh. 13 miles down. Found dead.
2895D	6 0	2 0	Spent,	Male,	24th Dec., 1902,	R. Blackwater. Lismore Weir.
	5 0	—	do.		29th Jan., 1903,	R. Blackwater.* Devine Stream. ¼ mile down. Found dead, killed by an otter.
4403D	10 0	2 5	Spent,	Male,	6th Feb., 1904,	R. Blackwater. Lismore Weir.
	18 0	3 0	Clean,		9th Nov., 1904,	R. Blackwater. Lismore Weir. Marked again D4905.
4410D	14 0	2 8	Clean,	Male,	6th Feb., 1904,	R. Blackwater. Lismore Weir.
	18 0	—	do.		25th Feb., 1905,	R. Blackwater. Lismore. Note.
4434D	12 0	3 0	Spent,	Male,	24th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.		20th Feb., 1905,	R. Blackwater. Cappoquin.

* NOTE.—The weights of spent (stripped) fish are throughout estimated only, those of clean fish when marked are also estimates, but on recapture the clean fish were weighed. The lengths of all fish are from actual measurements.

TABLE II.

No. of Mark.	*Weight.	Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. in.				
4336D	6 0	2 4	Spent,	Male,	20th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.		21st Dec., 1904,	R. Blackwater. Lismore Weir. Killing hatch.
4366D	8 0	2 8	Spent.	Male,	20th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.		21st Dec., 1904,	R. Blackwater. Lismore Weir. Killing hatch.
4539D	8 0	2 6	Spent	Female,	20th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.		21st Dec., 1904,	R. Blackwater. Lismore Weir. Killing hatch.
4591D	5 0	2 0	Spent,	Male,	20th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	2 0	do.		8th Feb., 1905,	R. Blackwater. Ballynatray Salmon Weir.
4919D	20 0	3 4	Clean,	Male,	29th Nov., 1904,	R. Blackwater. Lismore Weir.
	20 0	3 4	do.		7th March, 1905,	R. Blackwater. Lismore Nets.
4931D	18 0	3 0	Clean,	Female,	2nd Dec., 1904,	R. Blackwater. Lismore Weir.
	15 0	3 0	do.		14th March, 1905,	R. Blackwater. Lismore Nets.
4934D	8 0	2 0(?)	Clean,	Female,	3rd Dec., 1904,	R. Blackwater. Lismore Weir.
	8 8	2 4	do.		2nd Feb., 1905,	R. Blackwater. Youghal. 20 miles down.
4937D	16 0	2 8	Clean,	Female,	5th Dec., 1904,	R. Blackwater. Lismore Weir.
	18 0	—	do.		25th Feb., 1905,	R. Blackwater. Lismore Nets.
4943D	15 0	3 0	Clean,	Female,	6th Dec., 1904,	R. Blackwater. Lismore Weir.
	13 0	—	do.		March, 1905,	R. Blackwater. Lismore Nets.
4945D	9 0	2 8	Clean,	Male,	6th Dec., 1904,	R. Blackwater. Lismore Weir.
	11 0	—	do.		12th Feb., 1905,	R. Blackwater. Kilbarry. 9 miles up.
4989D	6 0	2 2	Spent,	Female,	8th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.		22nd Feb., 1905,	R. North Bride. Conna.
5303D	8 0	2 4	Spent,	Female,	8th Dec., 1904,	R. Blackwater. Lismore Weir.
	5 0	—	do.		25th Feb., 1905,	R. Blackwater. Kilbarry. 9 miles up.

*NOTE.—The weights of spent (stripped) fish are throughout estimated only, those of clean fish when marked are also estimates, but on recapture the clean fish were weighed. The lengths of all fish are from actual measurements.

TABLE II.

No. of Mark.	*Weight.		Length.	Condition.	Sex.	Date.	Locality, &c.
	Lbs. oz.	Ft. In.					
5369D	9 0	2 6	Clean,	.	Female,	13th Dec., 1904	R. Blackwater. Lismore Weir.
	9 0	2 6	do.			8th April, 1905,	R. Blackwater. Fort Grady. 49 miles up
5381D	16 0	2 11	Clean,	.	Female,	Dec., 1904	R. Blackwater. Lismore Weir.
	15 0	—	do.			7th March, 1905,	R. Blackwater. Lismore Neta.
5385D	12 0	2 9	Clean,	.	Female,	Dec., 1904,	R. Blackwater. Lismore Weir.
	10 0	—	do.			14th March, 1905,	R. Blackwater. Lismore Neta.
5392D	9 0	2 7	Spent,	.	Female,	Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.			22nd Feb., 1905,	R. Blackwater. Ballydoyle. 6 miles up.
5711D	15 0	3 0	Spent,	.	Male,	24th Dec., 1904,	R. Blackwater. Lismore Weir.
	12 0	—	do.			20th Feb., 1905,	R. Blackwater. Fort William. 2½ miles up.
5724D	7 0	2 6	Spent,	.	Male,	24th Dec., 1904,	R. Blackwater. Lismore Weir.
	4 0	—	do.			6th Feb., 1905,	R. Blackwater. Kilbarry. 9 miles up.
5739D	4 0	2 0	Spent,	.	Male,	24th Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.			2nd Jan., 1905,	R. Blackwater. Glen Stream.
5777D	8 0	2 6	Spent,	.	Male,	31st Dec., 1904,	R. Blackwater. Lismore Weir.
	—	—	do.			19th March, 1905,	R. Bride. Aghora.
5955D	8 0(?)	2 6(?)	Spent (?)	.	Female,	14th Jan., 1905,	R. Blackwater. Lismore Weir.
	14 0	2 11	Clean,			28th April, 1905,	R. Blackwater. Ardsallagh. 13 miles down.
5975D	12 0	3 0	Spent,	.	Male,	28th Jan., 1905,	R. Blackwater. Lismore Weir.
	10 0	—	do.			24th Feb., 1905,	R. Blackwater. Lismore Neta.

*NOTE.—The weights of spent (stripped) fish are throughout estimated only, those of clean fish when marked are also estimates, but on recapture the clean fish were weighed. The lengths of all fish are from actual measurements.

SECTION G.

During the three years with which this paper deals, the total number of marked spent (stripped) fish recaptured while still in the slat condition is twenty-eight. It is probable that this number does not represent the total recaptures, as none were reported in the spring or summer of 1904, though it is very possible that some were retaken.

The records have been tabulated below with a view to showing the movements of the fish, which, however, do not appear to present any very remarkable features, nor would it seem that the operations of marking and stripping have produced any abnormal habits. Analysis of the records shows that nine fish were retaken, usually within a few days after marking, at the Lismore Weir—six fish were retaken above the weir after intervals from forty to seventy-nine days; the greatest distance above Lismore at which fish were taken is nine miles, and the distance travelled does not appear to be determined by the interval of time—the remaining fish were taken below the weir, but this does not necessarily imply that they had not ascended and descended before recapture. Two of the fish recaptured below the weir were taken some distance up the River Bride, which flows into the estuary of the Black-water about nine miles below Lismore.

Objections have at times been raised against experimental marking on the score of injury to the fish, but so far as reported recaptures enable one to judge, these objections are not substantiated. During the past three years ten marked fish were returned as dead. In this number are included four fish for whose decease otters are said to have been primarily responsible, and one of the remaining six was taken alive in the nets but subsequently died; in the case of the others a considerable interval (forty to ninety-six days) had elapsed between marking and death. Further, it may be noted that were death due to the handling at stripping and marking, one would expect to find a greater mortality of female than of male fish; the reverse is the case, as an examination of the records will show (see Table II.).

The mortality due to marking is probably infinitesimal when compared with that induced by disease and natural causes (*cf.* Archer, *op. cit.*, p. 81).

[TABLE.]

SLATS (stripped fish) recaptured as slats in the same season.

Male Fish.

No. of Label.	Interval between marking and recapture.	Place of Recapture.
	Days.	
4556D	1	Lismore Weir.
4586D	1	do.
2304D	"a few days."	do.
2316D	do.	do.
5739D	9	Lismore, Glen Stream.
2333D	10	About 5 miles above Lismore.
2878D	20	Lismore.
2572D	27	About 6 miles below Lismore.
5975D	27	Lismore nets.
2893D	37	About $\frac{1}{2}$ mile below Lismore. Devine Stream.
2607D	40	About $3\frac{1}{2}$ miles above Lismore. Glenmore Stream.
5724D	44	About 9 mile above Lismore.
4521D	50	About 12 mile below Lismore.
2884D	56	About 2 miles below Lismore.
4434D	58	About 4 mil s below Lismore.
5711D	58	About $2\frac{1}{2}$ miles above Lismore.
2642D	59	About $2\frac{1}{2}$ miles below Lismore.
2641D	ca 68	About 20 miles below Lismore.
2606D	ca 73	About 20 miles below Lismore.
5777D	78	River Bride, Aghern.

Female Fish.

No. of Label.	Interval between marking and recapture	Place of Recapture.
	Days.	
4589D	1	Lismore Weir.
2307D	"a few days."	do.
2252D	do.	do.
2891D	ca 59	About 13 miles below Lismore.
5392D	ca 65	About 6 miles above Lismore.
4989D	76	River Bride, Conna.
5303D	79	About 9 miles above Lismore.
2214D	96	About $2\frac{1}{2}$ miles below Lismore.

SECTION H.

Stripped Fish recaptured as Clean in the following Open Season.

- D. 5955.—Female, marked at Lismore Weir 14th January, 1905; 8 lbs. (est.), 2 ft. 6 in.
 Recaptured 28th April, 1905, at Ardsallagh, thirteen miles below Lismore; 14 lbs., 2 ft. 11 in.

The record above must be received with caution, though it is not easy to see where the error was made. The weight at the time of marking is an estimate only, and probably incorrect, but I have no reason to doubt the accuracy of the length nor does it appear, from correspondence with the gentleman, who recaptured the fish, that any mistake in weight or measurement was made by him. The fish, when recaptured, is described as a spring fish, which would hardly be the case if the fish were merely a well-mended silvery kelt.

Amongst the Scottish records *vide* Calderwood,* I find a fish, No. 2823, marked as a female kelt of 15 lbs., and 3 ft., on 3rd January, 1899, and recaptured *in the sea* on the 1st March following. The fish is described as clean, but there appears to have been some mistake made in taking the weight.

Other instances of fish recovering condition in the short space of three and a half months appear to be of natural slats, marked as such, in the end of March or middle of April, and recaptured as clean at the mouth of the River Brora (*vide* Holt, *op. cit.*, p. 180).

I can, however, trace no previous Irish record of a spent fish recaptured as clean at so early a date as April, and, moreover, the cases of spent fish retaken at Lismore would suggest that many of them are in no hurry to leave the river.

SECTION J.

Clean Fish recaptured as Clean in the Second succeeding Season.

- D. 4410.—Male, marked at Lismore 6th February, 1904;
14 lbs. (est.), 2 ft. 8 in.
Recaptured in Lismore nets 25th February,
1905; 18 lbs.

The record of D. 4410 presents features which are in many respects peculiar, and stands alone so far as the returns of marked fish are concerned. I am, however, informed by Mr. Godfrey that similar fish have before now been noted at Lismore, though he does not state how they were identified in the two seasons. The history of D. 4410 is as follows:—the fish was netted at the killing hatch, Lismore, in December, 1903, and was considered a springer, but was placed in the holding ponds to see whether it would develop sexual products. At the close of the spawning season, February, 1904, the fish was still bright, like a springer, and was accordingly marked and released.

Prior to the Report of 1901 (Holt, *op. cit.*, p. 195), it would have been generally considered that such a fish would remain in the river, maturing its sexual products, and descending as a slat in the spring of the following year, but, as was shown by the records of D. 858 and D. 861, some of the early spring fish in the Blackwater descend to the sea before spawning.

* 20th Ann. Rep. Fish. Bd., Scot., Pt. II., p. 80.

Returning once more to the history of D. 4410 we find that it was recaptured as an undoubted springer in February, 1905; the fish was taken in the Lismore nets, which fish at Lismore Castle, and $2\frac{1}{2}$ miles below Lismore Bridge.

The early date of capture and the condition of the fish practically preclude the possibility of its having spawned in the previous winter. It must, however, be admitted that such a possibility does exist, though even the doubtful record (see p. 50) would hardly account for a spent fish being clean at such an early date.

If the fish did not spawn in the winter of 1904 it may possibly have been barren, or else may represent a class of fish which not only do not spawn annually, but need not even do so biennially.

SECTION K.

Clean Fish recaptured as Clean Fish.

The following recaptures falling within this section have been made since the publication of the previous Report. The weights are omitted throughout, as those given for the fish at the time of marking (see Table II.) are estimates only; they are, therefore, of no value in considering the change of weight, if any, of the fish during the interval between marking and recapture.

Arrangements have been made for weighing the clean fish taken this winter at Lismore, and it is hoped that some further light may be thrown on the question of the change of condition of the early running fish.*

Female Fish.

- 2868 D.—Marked 24th December, 1902; recaptured after 139 days at Fort Grady, about forty-nine miles above Lismore.
- 2872 D.—Marked 24th December, 1902; recaptured after 145 days at the same place as D. 2868.
- 5369 D.—Marked 13th December, 1904; recaptured after 116 days at the same place as D. 2868.
- 4931 D.—Marked 2nd December, 1904; recaptured after 102 days in the Lismore nets.
- 4934 D.—Marked 3rd December, 1904; recaptured after sixty-one days at Youghal, about twenty miles below Lismore.
- 4937 D.—Marked 5th December, 1904; recaptured after eighty-two days in the Lismore nets.
- 4943 D.—Marked 6th December, 1904; recaptured about eighty-five days later in the Lismore nets.

* Cf. Calderwood.—22nd Ann. Rep. Fish. Bd., Scot., Pt. II., p. 94.

5381 D.—Marked December, 1904; recaptured 7th March, 1905, in the Lismore nets.

5385 D.—Marked December, 1904; recaptured 14th March, 1905, in the Lismore nets.

Male Fish.

4919 D.—Marked 29th November, 1904; recaptured after ninety-eight days, in the Lismore nets.

4945 D.—Marked 6th December, 1904; recaptured after sixty-eight days at Kilbarry, about nine miles above Lismore.

An analysis of the eleven records shows that four fish were recaptured above the place of marking, one fish twenty miles below, and the remainder in the Lismore nets, which have one hauling station below the weir opposite Lismore Castle and another about $2\frac{1}{2}$ miles below Lismore Bridge.

The fact that seven out of the ten were retaken below the weir would appear to form additional evidence for the correctness of the belief at Lismore that winter clean fish make only a temporary stay in the river (*cf.* Holt, *op. cit.*, p. 195). It may, however, be noted that the recaptures below the weir took place in February or early in March, while those from the higher reaches (D. 2868, D. 2872) were in May.

It is also by no means impossible that a further study of the clean winter fish in the Blackwater may show a division into two classes, one which remains in the rivers and spawns in the winter following, while the other makes only a temporary stay, and perhaps does not spawn in the winter following, *cf.* D. 4410, p. 50.

The Scottish experiments suggest that the movements of the early clean run fish are largely influenced by the temperature and height of the water; further investigations on these points in regard to the River Blackwater will therefore be necessary when an attempt is made to settle the general question.

iv.—STATISTICAL INFORMATION RELATING TO
THE SALMON FISHERIES.

By the courtesy of the gentlemen whose names appear below, it is possible to give the following Returns in continuation of those which appeared in our Reports for 1900-1903, and in the Report of the Irish Inland Fisheries Commission (Appendix, Part II., xxiii.) :—

PERCENTAGES OF WEIGHT OF TAKE ABOVE AND BELOW AN
AVERAGE FOR TWENTY-FIVE YEARS ENDING 1899. (*Twenty-three years in the case of the Lax Weir Fisheries*) :—

Blackwater, Lismore.		Mr. R. FOLEY.
1902,	35	per cent. below.
1903,	18	" "
1904,	50	" "

The killing hatch was kept open during the first three months of 1902, and during February, March and April in 1903 and 1904.

Mr. Foley notes that the fall in 1904 is to be attributed to the great decrease in the quantity of grilse.

Blackwater, Co. Kerry.		Mr. R. M'CLURE.
1902,	10.5	per cent. above.
1903,	38.6	" below.
1904,	82.8	" "
Waterville, Co. Kerry.		Mr. J. E. BUTLER.
1902,	26	per cent. below.
1903,	43	" "
1904,	41.6	" "

Mr. Butler writes :—" Ample water during all fishing season. A very poor run of peal."

Laune, below Killorglin Bridge.		Mr. R. POWER.
1902,	12	per cent. below the average of the twenty-four years ending 1898.
1903,	12	per cent. below ditto.
1904,	47	" " "

Mr. Power writes :—" Only on four occasions since 1869 had fewer fish been taken. The falling off was very marked in the grilse."

Lax Weir (including weir and nets), Shannon.		Mr. J. A. PLACE.
1902,	74	per cent. above.
1903,	4	" below.
1904,	57	" "

Mr. Place writes:—

"Only once, in 1888, have we had such a very bad season. From what I can gather, there was a fair run of spring salmon in the Shannon, but owing to the floods and wild weather, we could not catch them. For nearly four weeks in the early spring the weir was not fishing at all. In the peal season, the weather and water were excellent, but there was an utter absence of peal, compared with an average year. They did not come either during the season or after.

Average Weight of Salmon,	. . .	15·7 lbs.
" " Peal,	. . .	4·8 lbs.

The weight of the peal, in my opinion, confirms what I have repeatedly drawn attention to, viz.—that in bad seasons the fish for the most part are in miserable condition."

Bann Nets.	MR. T. M'DERMOTT.
1902, . . .	9·75 per cent. below.
1903, . . .	17 " "
1904, . . .	8·5 " "

Foyle Nets.	MR. T. M'DERMOTT.
1902, . . .	31·75 per cent. below.
1903, . . .	6·5 " above.
1904, . . .	6·5 " below.

Erne Nets.	MR. T. M'DERMOTT.
1902, . . .	1 per cent. above.
1903, . . .	30 " below.
1904, . . .	65 " "

Erne Angling.	MR. T. M'DERMOTT.
1902, . . .	26·2 per cent. below.
1903, . . .	13·08 " "
1904, . . .	32 " "

Moy Tidal.	MR. J. GARVEY.
1902, . . .	5 per cent. above.
1903, . . .	10 per cent. above average of good years.
1904, . . .	45 per cent. below.

Mr. Garvey notes that the low figure is due to the failure of the grilse. The salmon fishing season was one of the best, but the grilse were very few and very small and poor.

OTHER RETURNS.

Blackwater.—Dromana Fishery. MR. VILLIERS STUART.

—	Salmon.	Peal.	Total.
1902, . .	217	1,070	1,286
1903, . .	324	525	849
1904, . .	426	580	812

Castleconnell Angling.

MR. S. C. VANSITTART.

—	Salmon.		Peal.		Total for Season Salmon.	Total for Season Peal.	Total.
	1st Feb. to 31st May.	1st June to 31st Oct.	1st Feb. to 31st May.	1st June to 31st Oct.			
Worldsend and Ermagh.	1902, 26	5	-	4	31	4	35
	1903, 13	4	-	10	17	10	27
	1904, 23	5	-	2	28	2	30
Newgarden, .	1902, 24	1	-	16	25	16	41
	1903, 25	5	-	90	30	90	120*
	1904, 26	3	-	34	29	34	63*
Summerhill and Castle.	1902, 25	9	-	13	34	13	47
	1903, 20	5	-	20	31	20	51
	1904, 37	12	-	13	49	13	62
Woodlands, .	1902, 12	2	-	12	14	12	26
	1903, 8	2	-	5	10	5	15†
	1904, 10	4	-	3	14	3	17
Doonas, .	1902, 24	4	-	35	38	35	73
	1903, 46	5	-	38	53	33	91
	1904, 54	11	-	39	65	30	95
Hermitage, .	1902, 21	10	-	45	51	46	77
	1903, 27	11	-	35	58	35	73
	1904, 31	2	-	17	33	17	50
Landscape, .	1902, 8	3	-	40	11	40	51
	1903, 8	-	-	15	8	15	23†
	1904, 8	-	-	-	8	-	8
Prospect, .	1902, 18	6	-	43	24	43	67
	1903, 13	-	-	68	13	68	81*
	1904, 20	3	-	20	23	20	43

* To 31st July only.

† To 30th June only.

Mr. Vansittart writes :—" A very bad peal season."

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Suir.—Cahir Park and Neddin's

Water.

MR. W. ROCHFORD.

Cahir Park—1902, . 21 salmon, weighing 207½ lbs.

1903, . 59 " " 621 "

1904, . 48 " " 606 "

Neddin's Water—1902, . 9 " " 78 "

1903, . 43 " " 447 "

1904, . 46 " " 730 "

Waterville Salmon Fishery.

MR. J. E. BUTLER.

—	Jan. 1st to 15th.	Jan. 16th to 31st.	Feb- ruary.	March.	April.	May.	June.	July.	Total.
1902. . .	29	11	29	25	32	13	279	82	501
1903. . .	44	39	72	47	6	18	84	49	357
1904. . .	63	30	57	40	47	29	68	31	367

RETURNS OF IRISH SALMON FROM BILLINGSGATE.

MR. J. WRENCH TOWSE.

—	Number of Boxes of Irish Salmon.			Average Price per lb.			No. of Boxes from all sources.*		
	1902.	1903.	1904.	1902.	1903.	1904.	1902.	1903.	1904.
January. . .	27	32	42	s. d. 3 5	s. d. 3 11½	s. d. 4 2½	197	165	112
February. . .	212	227	238	2 3	2 0	2 3	807	977	918
March. . .	279	309	481	2 5	2 5	2 3½	1,153	1,387	1,627
April. . .	354	688	711	2 7	2 0½	2 1½	1,504	2,062	2,145
May. . .	635	789	964	2 2	1 7	1 9	2,802	3,532	3,207
June. . .	2,792	1,571	1,946	1 7	1 3½	1 5½	6,281	5,859	5,768
July. . .	2,586	4,745	1,941	1 1	1 2	1 2½	9,579	9,357	8,610
August. . .	88	226	222	1 2	1 2	1 5½	3,934	3,853	3,277
September. . .	1	1	3	1 8	1 6	2 0	744	833	427
October. . .	-	-	-	-	-	-	100	154	41
November. . .	-	-	-	-	-	-	33	66	25
December. . .	-	-	-	-	-	-	34	92	47
	6,974	8,036	6,528	-	-	-	27,183	25,487	20,264

* Including English, Scotch, Irish, Dutch, Norwegian, French, Danish, and Canadian.

V.—SUBSTANCE OF REPORTS RECEIVED FROM CLERKS

DISTRICT.	What is the general state of the Salmon Fisheries in this District? Are they as a rule improving or declining?	
	1903.	1904.
Dublin, . . .	Fair; slight improvement, . . .	Fair; about the same as last year, . . .
Wexford, . . .	Improving, . . .	Improving, . . .
Waterford, . . .	Improving; the open season as regards take of Salmon was the best for the past twenty years.	Fairly satisfactory; improving, . . .
Lisnooe, . . .	Good; improving, . . .	Good; improving, . . .
Cork, . . .	Fairly good; declining, . . .	Fairly good; slight improvement, . . .
Cork (Bandon), . . .	Good; improving, . . .	Fair; showing tendency to improve, . . .
Skibbereen, . . .	Great improvement; has been the best season for net fishermen for some years.	Very poor; great falling off from last year, . . .
Bantry, . . .	Good; improving, . . .	Bad; declining, . . .
Kenmare, . . .	Fair, but not so good as in previous years.	Very bad; declining, . . .
Waterville, . . .	Fair. No change for the past two years.	Fairly good; improving, . . .
Killarney, . . .	Fair; improving, . . .	Poor; not improving, . . .
Limerick, . . .	On the whole more satisfactory than in recent depressed years.	Unsatisfactory, especially for peale—worse than the average of preceding years.
Galway, . . .	Not so good as last year, either as to supply or capture.	Not so good as last year either as to supply or capture.
Connemara, . . .	Fair; improving, . . .	Fair; improving, . . .
Ballinakill, . . .	Declined since last year, . . .	Very bad; declining, . . .
Bangor, . . .	Not so good as in preceding year; declining.	Very bad; declining, . . .
Ballina, . . .	Fair; improving, . . .	Very bad, . . .
Sligo, . . .	Fair; improving, . . .	Fairly good; inclined to improve, . . .
Ballyshannon, . . .	Good; neither improving or declining, . . .	Not so good in the estuaries; sea fishing better.
Letterkenny, . . .	Fair, . . .	Prospect very fair; no remarkable change.
Londonderry, . . .	Satisfactory; improved, . . .	Fair; about average, . . .
Coleraine, . . .	Not quite so good as last season, . . .	Improving, . . .
Ballycastle, . . .	Declining, . . .	Improvement, . . .
Dundalk, . . .	Generally very good; improving, . . .	Fair; not so good for angling, but better for netting.
Drogheda, . . .	A general improvement on preceding year.	Fair; improving, . . .

OF CONSERVATORS RELATIVE TO SALMON FISHERIES

Has the take of Salmon and Grilse by nets and weirs throughout the district been more, or less, productive in the present year than in the past one?		DISTRICT.
1903.	1904.	
More productive,	More spring fish taken, but much less Grilse.	Dublin.
More Salmon—less Grilse,	More Salmon; less Grilse,	Wexford.
Far more Salmon, but less Grilse,	Somewhat less productive, especially as regards Grilse.	Waterford.
The take generally shows a very good increase as compared with previous years.	The take of Salmon very good; the take of Grilse poor.	Lismore.
Less productive,	Less; little or no Grilse taken by nets,	Cock.
More productive,	About the same,	Cork (Bandon).
More productive,	Less productive,	Skibbereen.
Less productive,	Less productive,	Bantry.
Less productive,	Less productive in present year,	Kenmare.
Less productive,	Net fishing poor in consequence of inclement weather; weirs much improved.	Waterville.
More productive,	Less productive,	Killarney.
Less productive,	Take of Salmon something less, but that of Grilse enormously less.	Limerick.
Less productive,	Less productive,	Galway.
—	—	Connemara.
Very much less,	Very much less productive,	Ballinakill.
Less productive,	Very much more productive,	Bangor.
Slightly more productive,	Considerably less productive,	Ballina.
About the same,	About the same,	Sligo.
Less productive,	Less in the rivers,	Ballyshannon.
More productive,	Very much more productive,	Lettakenny.
More productive,	Somewhat less productive,	Loadonderry.
Less productive,	More productive,	Coleraine.
Less productive,	More productive,	Ballycastle.
More productive,	More productive,	Dundalk.
An increase in the take of Salmon, but not in that of Grilse.	More productive; marked increase.	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	Has the take of Sea Trout by nets and weirs been more, or less, productive this year than in the past one?	
	1903.	1904.
Dublin, . . .	Less productive,	More productive,
Wexford, . . .	More productive,	Less productive,
Waterford, . . .	Very little netting for Sea Trout.	No record of any Sea Trout taken in this District.
Lismore, . . .	More productive,	More productive,
Cork, . . .	About the same,	Less,
Cork (Bandon), . . .	More productive,	About the same,
Slough, . . .	More productive,	About the same,
Bantry, . . .	Less productive,	More productive,
Kenmare, . . .	No nets for Sea Trout used in this district.	No netting for Sea Trout in the district, . .
Waterville, . . .	Very few Sea Trout taken in the district by nets.	Net fishing poor in consequence of inclement weather; weirs much improved.
Killarney, . . .	About the same,	No nets or weirs for capture of Sea Trout in District.
Limerick, . . .	This kind of fishing is never of any consequence in the Shannon.	None taken in Shannon for commercial purposes.
Galway, . . .	Less productive,	About the same,
Connemara, . . .	—	—
Ballinakill, . . .	Very much less,	Very much less productive,
Bangor, . . .	Less productive,	Less productive,
Ballina, . . .	No,	An average,
Sligo, . . .	No,	Better this year,
Ballyshannon, . . .	Slightly more productive in River Erne, . .	More productive in River Erne, . .
Letterkenny, . . .	More productive,	Much more productive,
Londonderry, . . .	More productive,	Somewhat less productive,
Coleraine, . . .	Less productive,	No perceptible difference,
Ballycastle, . . .	Very few taken,	About the same,
Dundalk, . . .	Less productive,	About the same,
Drogheda, . . .	Considerably less,	Less productive by one-half,

of CONSERVATORS relative to SALMON FISHERIES--continued.

Has any peculiarity been observed in the date at which fish have appeared in the rivers this season ?				DISTRICT.
1903.		1904.		
Earlier than usual,	.	.	No Grilse were taken at July,	Dublin.
Grilse were late,	.	.	Grilse were late,	Wexford.
No,	.	.	No,	Waterford.
No,	.	.	No,	Lismore.
No,	.	.	None, except some Spring Salmon observed in December,	Cork.
No,	.	.	No,	Cork (Bandon).
No,	.	.	Yes ; Salmon appeared this year in April .	Skibbereen.
No,	.	.	No,	Bantry.
No,	.	.	No,	Kenmare.
No,	.	.	No,	Waterville.
No,	.	.	No,	Killarney.
No,	.	.	No,	Limerick.
No,	.	.	Grilse commenced to run earlier than usual,	Galway.
No,	.	.	No,	Connemara.
No,	.	.	No,	Ballinakill.
No,	.	.	No,	Bangor.
Grilse were later in running,	.	.	No, but the Grilse came in small and poor condition,	Ballina.
No,	.	.	No,	Sligo.
Fish appeared in the rivers about two weeks later.	.	.	Yes ; appeared later,	Ballyshannon.
No,	.	.	No,	Letterkenny.
No,	.	.	No,	Londonderry.
No,	.	.	No,	Coleraine.
No,	.	.	An earlier run of Spring fish appeared in the Bush than usual.	Ballycastle.
No,	.	.	No,	Dundalk.
Grilse and White Trout about fourteen days later than in previous year.	.	.	Runs poor in February and March,	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

District.	Between what dates did the principal migration of smolts take place? Was it larger or smaller than usual?	
	1903.	1904.
Dublin, . . .	May and June—also in the Autumn. Larger.	May and June. Not larger than usual. .
Wexford, . . .	March and April. Larger, . . .	March, April, and May. About same as last year.
Waterford, . . .	End of March, April, and May. Larger. On Barrow run continued longer than usual. General run very good. About same as in 1902.	Early part of April and May. Larger, .
Lismore, . . .	From 17th March to end of May. Much larger.	From middle of March to end of April. Larger than usual.
Cork, . . .	Between 5th and 28th March, . . .	Between middle of March and 1st May. Larger.
Cork (Bandon), . . .	Between 1st April and 1st May. Much larger.	25th March and 4th May. Larger, .
Skihbeen, . . .	Between 6th April and 9th May. Average.	10th April and 16th May. Same as usual.
Bantry, . . .	April and May. As usual, . . .	April and May. As usual, . . .
Kenmare, . . .	April and May, . . .	March and April. Cannot say, . . .
Waterville, . . .	April and May. No change, . . .	April and May. Larger, . . .
Killarney, . . .	March to May, inclusive. About the same.	March to May. About same, . . .
Limerick, . . .	April and May. Average, . . .	April and May. Up to usual average, .
Galway, . . .	April and May. Average, . . .	April and May, . . .
Connemara, . . .	April and May. Average, . . .	April to May. About the same, . . .
Ballinakill, . . .	Cannot say, . . .	Cannot ascertain, . . .
Bangor, . . .	End of April to end of May. About the same.	End of April and May, . . .
Ballina, . . .	April and May, . . .	April and May. Smaller, . . .
Sligo, . . .	About 12th May to middle of June. Larger.	April, May, and first week in June. More numerous.
Ballyshannon, . . .	April and May. Larger, . . .	Middle of April to end of May. Larger, .
Letterkenny, . . .	Date not known, . . .	Could not be ascertained, . . .
Londonderry, . . .	1st April and 15th June. About the same.	1st April to 15th June. About the same, .
Coleraine, . . .	Early in April to end of June. Average.	1st April to end of June. Larger, .
Ballycastle, . . .	End of May to beginning of June. Average.	Rivers are generally clear before end of June. Larger.
Drumalk, . . .	Between 1st and 31st May. No change, .	May. No change, . . .
Droghda, . . .	April and May. Larger, . . .	April and May. Average, . . .

of CONSERVATORS relative to SALMON FISHERIES—continued.

Has there been observed more than one migration of Smolts to the sea during the season? If so, state dates when these migrations took place.		District.
1903.	1904.	
Yes; late in August.	Not this year.	Dublin.
Yes; on 8th May.	No.	Wexford.
No.	No.	Waterford.
No.	No.	Lismore.
No.	No.	Cork.
No.	No.	Cork (Bandon).
No.	No.	Skibbereen.
No.	No.	Bantry.
None observed.	No.	Kenmare.
No.	No.	Waterville.
No.	No.	Killarney.
Yes; in September.	Yes; there is an Autumn run, chiefly in September.	Limerick.
Yes; in September.	Yes; small run in October; not as numerous as usual.	Galway.
No.	No.	Connemara.
Cannot say.	—	Ballinakill.
No.	No.	Bangor.
No.	Smolts were not observed to any extent.	Ballina.
Yes; but date not noted.	Yes; about end of August.	Sligo.
No.	No.	Ballyshannon.
No.	No.	Lettickenny.
Yes; but date not noted.	Yes; cannot give dates.	Londonderry.
No.	Several migrations with each flood from 1st April to end of June.	Coleraine.
No.	No.	Ballycastle.
No.	No.	Dundalk.
No.	Yes; the run continued for some time in June.	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	In your opinion was the weather favourable or (L.) To Netting.	
	1903.	1904.
Dublin, . . .	Favourable,	Favourable,
Wexford, . . .	Unfavourable,	Unfavourable,
Waterford, . . .	Favourable,	Favourable,
Lismore, . . .	Favourable,	Favourable,
Cork, . . .	Unfavourable,	Unfavourable,
Cork (Bandon), . .	Unfavourable for first four or five weeks	Favourable,
Skibbereen, . . .	Favourable,	Unfavourable,
Bantry, . . .	Unfavourable,	Unfavourable,
Kemmare, . . .	Favourable to middle of July, . . .	Unfavourable,
Waterville, . . .	Unfavourable,	Unfavourable,
Killarney, . . .	Part of the season was unfavourable in the rivers owing to floods, but favourable in the lakes.	Favourable,
Limerick, . . .	Very unfavourable in Spring—normal in Summer.	Unfavourable in Spring; favourable in peak season.
Galway, . . .	Unfavourable in Spring; moderately favourable during Summer months.	Generally favourable,
Connemara, . . .	Unfavourable,	Unfavourable,
Ballinakill, . . .	Unfavourable,	Unfavourable,
Bangor, . . .	Unfavourable,	Favourable,
Ballina, . . .	Favourable,	Favourable,
Sligo, . . .	Favourable,	Favourable,
Ballyshannon, . . .	Favourable in the beginning, but unfavourable in the latter part of the season.	About same as usual,
Letterkenny, . . .	Favourable,	Unfavourable,
Londonderry, . . .	Fairly favourable,	Favourable,
Coleraine, . . .	Favourable in inland waters; unfavourable in the tidal.	At sea unfavourable. In tidal and upper waters favourable.
Ballycastle, . . .	Unfavourable,	Favourable,
Dundalk, . . .	Favourable on the whole, but to some extent interrupted by floods.	Favourable,
Drogheda, . . .	The heavy waters subsequent to the storm of 25th February, 1903, interfered with both angling and netting in the upper waters.	Favourable,

of CONSERVATORS relative to SALMON FISHERIES—continued.

unfavourable in each month of the open season ? (II.) To Angling.		CONSTANT
1903.	1904.	
Favourable	Unfavourable,	Dublin.
Favourable,	Favourable,	Wexford.
Favourable,	Favourable in early part of season,	Waterford.
Favourable,	Very favourable,	Limerick.
Unfavourable,	Unfavourable,	Cork.
Favourable,	Favourable,	Cork (Bandon)
Favourable,	Unfavourable,	Skibbereen.
Favourable,	Favourable,	Bantry.
Favourable to middle of July,	Unfavourable,	Kemmare.
Unfavourable,	On the whole rather unfavourable,	Waterville.
Favourable on the whole,	Favourable,	Killarney.
Very favourable for some districts. Unfavourable in others.	Favourable in Spring; fairly so in Summer,	Limerick.
Very unfavourable during February, March, and April. Moderately favourable in May, June, and July.	Generally favourable,	Galway.
Favourable,	Favourable,	Connemara.
Favourable,	Favourable,	Ballinakill.
Favourable,	Favourable, except in Newport River,	Bangor.
Favourable,	Favourable,	Ballina.
Favourable,	Not quite so favourable,	Sligo.
Favourable,	Favourable,	Ballyhaanoo.
Favourable,	Unfavourable during part of season,	Lettickenny.
Favourable,	Favourable,	Londonderry.
Unfavourable,	Favourable in River Bann; unfavourable in small rivers.	Coleraine.
Unfavourable in early part of season, improved towards the end.	Favourable,	Ballycastle.
Favourable,	Favourable,	Dundalk.
The heavy waters subsequent to the storm of 26th February, 1903, interfered with both angling and netting in the upper waters.	Favourable,	Orogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	At what period of the year is Grilse first taken?	
	1903.	1904.
Dublin, . . .	June,	July,
Wexford, . . .	June, July, and August,	June,
Waterford, . . .	June,	About May,
Lismore, . . .	Early in May,	and May,
Cork,	Early in May,	About 1st May,
Cork (Bandon), . . .	Middle of June,	Early in June,
Skibbereen, . . .	End of June,	Middle of April,
Bantry,	July,	July,
Kenmare,	June,	June,
Waterville, . . .	June,	Middle of May,
Killarney, . . .	End of May,	End of May,
Limerick,	End of May,	End of May,
Galway,	End of May,	12th April,
Connemara, . . .	June,	Ballinabluich early in June—other fisheries middle to end of June.
Ballinakill, . . .	Middle of June,	1st June,
Bangor,	End of May,	June,
Ballina,	June,	—
Sligo,	About middle of May,	May and June in Sligo division; July and August in Ballinodare.
Ballyshannon, . . .	June,	End of June,
Letterkenny, . . .	June,	Between middle of June and August,
Londonderry, . . .	End of May,	Beginning of June,
Coleraine,	End of May,	End of May, June, and July,
Ballycastle, . . .	Middle of May,	First or second week in May,
Dundalk,	June,	June,
Drogheda,	June,	June,

of CONSERVATORS relative to SALMON FISHERIES—*continued.*

During what months is the greatest quantity observed or taken ?				DISTRICT.
1903.		1904.		
End of July,	.	July,	.	Dublin,
July,	.	July,	.	Wexford.
July and August,	.	End of July and beginning of August,	.	Waterford
June and July,	.	June and July,	.	Lismore.
June and July,	.	Middle of June and July,	.	Cork.
June and July,	.	Middle of June to middle of July,	.	Cork (Bandon),
August,	.	August,	.	Salthaven.
July,	.	July,	.	Bantry.
July,	.	July,	.	Kemmare.
August,	.	June,	.	Waterville.
June and July,	.	June and July	.	Killarney.
June,	.	June,	.	Limerick,
June and July,	.	June and July,	.	Galway,
June and July,	.	Ballinahinch June—other fisheries July,	.	Connemara.
June and July,	.	Last week in June and first fortnight in July,	.	Ballinakill,
July,	.	July,	.	Bangor.
June and July,	.	—	.	Ballina.
End of June,	.	Mayo and June in Sligo division; July and August in Ballacorney,	.	Sligo.
July,	.	July,	.	Ballyshannon.
June to August,	.	Between middle of June and August,	.	Letterkenny.
July,	.	July,	.	Londonderry.
July,	.	June and July,	.	Coleraine.
Middle of June to middle of July	.	24th June and 12th July,	.	Ballycastle.
July,	.	July,	.	Dundalk.
July,	.	July,	.	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	During what months are many Salmon taken with the Grise, and are these Salmon on an average heavier or lighter than at other periods?	
	1903.	1904.
Dublin, . . .	June; heavier,	July; about the same as last year, . . .
Wexford, . . .	June; heavier,	June and July; heavier,
Waterford, . . .	July and August; lighter,	July and August; lighter as a rule, . . .
Lismore, . . .	May and June; lighter,	May and June,
Cork,	April and May; about the same,	April and May; about the same weight, . . .
Cork (Bandon), . . .	June and July; heavier,	June and July; average,
Skibbereen, . . .	July and August; heavier,	July and August; heavier,
Bantry,	June and July; heavier,	June and July,
Kenmare,	July; heavier,	June and July,
Waterville, . . .	July; lighter,	May and June; somewhat lighter, . . .
Killarney, . . .	June; heavier,	End of May and beginning of June; about same,
Limerick,	May; lighter,	May; lighter,
Galway,	June and July; lighter,	July; lighter,
Coucemarra, . . .	July and August; heavier on Ballinabioch, average elsewhere,	July and August; much the same weight as during the rest of the season, . . .
Ballinakill, . . .	June; same weight,	June; much the same,
Bangor,	May and June; heavier,	May and June; no change,
Ballina,	June and July; same weight,	Not known; smaller,
Sligo,	May to July; heavier,	May and June; average weight better, . . .
Ballyshannon, . . .	June and July; very little difference,	End of June; lighter,
Letterkenney, . . .	June and July,	June and July; heavier,
Londonderry, . . .	June to August,	June, July, and August,
Coleraine,	May and June; lighter,	June and August; heavier in tidal waters, . . .
Ballycastle, . . .	—	Fish were observed to be getting heavier after 20th July,
Dundalk,	July and August; lighter,	July and August; lighter,
Drogheda,	Lighter,	July; lighter,

of CONSERVATORS relative to SALMON FISHERIES—*continued*.

In what months are the greatest quantities of Salmon (not Grise) captured?		District.
1903.	1904.	
June,	June,	Dublin.
April and May,	April and May,	Wexford.
May and June,	February, March, April, and May,	Waterford.
February to May,	February to June,	Lismore.
March and April,	April,	Cork.
May for nets; April for rods,	April and May,	Cork (Bandon).
August and September,	August and September,	Skibbereen.
June,	June,	Bantry.
June and July,	July,	Kemmare.
February to April inclusive,	February, March, and April,	Waterville.
January to April, inclusive,	January to April,	Killarney.
April and May,	April and May,	Limerick.
March to May inclusive,	April,	Galway.
August and September on Costello, Screeb, and Inver. Other fisheries July and October.	July, August, September, and October,	Connemara.
May and June,	First week in June,	Ballinakill.
April and May,	April and May,	Bangor.
Up to May,	To end of May,	Ballina.
January and February, in Sligo River May and June.	June,	Sligo.
May and June,	May and June,	Ballythangoe.
July and August,	July and August,	Letterkenny.
July and August,	July and August,	Londonderry.
May,	May, June, and July,	Coburne.
April and from last week in July to end of season.	20th May and 20th July,	Ballycastle.
February and March, April to June, in- clusive.	April, May, and August,	Dundalk.
—	April and May,	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	Can it be ascertained what proportion the capture of Grilse bears to the capture of Salmon?	
	1903.	1904.
Dublin, . . .	100 to 11,	About equal numbers taken,
Wexford, . . .	More than double the number of Salmon,	No; bad year for Grilse,
Waterford, . .	3 to 1 in tidal waters,	No; but take of Grilse less than that of Salmon.
Lismore, . . .	No,	Cannot be ascertained
Cork,	About 2 to 1,	Cannot be ascertained,
Cock (Bandon), .	No,	No,
Skibbereen, . .	About equal	About equal,
Bantry, . . .	15 to 1	10 to 1,
Kemmare, . . .	10 to 1,	10 to 1,
Waterville, . .	About 2 to 1,	1 to 5. Fishermen of Grilse season go in more for White Trout fishing—hence the proportion.
Killarney, . . .	About 3 to 1	2 to 1,
Limerick, . . .	6 to 1,	About 3 or 4 to 1
Galway, . . .	5 to 1,	11 to 1,
Cornemara, . .	Ballinabunch and Screech about equal; other fisheries 3 to 1.	On Ballinabunch and Screech about equal. Other fisheries 3 to 1.
Ballinakill, . .	4 to 1,	3 to 1,
Bangor, . . .	18 to 1,	20 to 1,
Ballina, . . .	Cannot tell,	No; but greater portion were Grilse, . .
Sligo,	4 to 1,	Sligo Division, 3 to 1; Ballinacorney, 6 to 1,
Ballyshannon, .	2 to 1,	2 to 1,
Letterkenny, . .	3 to 1,	5 to 1,
Londonderry, . .	No; but greater number of Grilse, . .	Majority Grilse
Coleraine, . . .	2 to 1,	2 to 1,
Ballycastle, . .	—	Cannot be ascertained,
Dundalk, . . .	No,	Cannot be ascertained,
Doaghed, . . .	The capture of Salmon is far in excess of that of Grilse.	Capture of Salmon far in excess of that of Grilse.

of CONSERVATORS relative to SALMON FISHERIES—*continued*.

Is there any increase in the average size of the Spring Salmon or Grilse? Give average weight of Salmon and Grilse in the season of this year as far as practicable.		District.
1903.	1904.	
No. Salmon 13 lbs., Grilse 3 lbs.	Increase in case of Spring Salmon. Salmo 11 lbs., Grilse 3 lbs.	Dublin.
No. Salmon 12 lbs., Grilse 3 lbs.	Salmon 11 or 12 lbs., Grilse 3 lbs.	Wexford.
No. Salmon 12 lbs. to 14 lbs., Grilse 4½ lbs. to 5 lbs.	No. Salmon 12 lbs., Grilse 3 lbs.	Waterford.
Yes. Salmon 14 lbs. to 27 lbs., Grilse 3 lbs. to 7 lbs.	No. Salmon 7 to 27 lbs., Grilse 6 to 7 lbs.	Lismore.
No. Salmon 12 lbs., Grilse 3 lbs.	Spring Salmon 9 lbs., Grilse 3 lbs.	Cork.
Yes.	No. Salmon 12 lbs., Grilse 3 lbs.	Cork (Bandon)
No. Salmon 9 lbs.	No. 10 lbs.	Skibbereen.
Yes. Salmon 16 lbs., Grilse 6 lbs.	No. Salmon 16 lbs., Grilse 6 lbs.	Bantry.
No. Salmon 10 lbs., Grilse 6 lbs.	Salmon 10 lbs., Grilse 3 lbs.	Kenmare.
No. Salmon 11 lbs., Grilse 1 lb.	Yes. Salmon, 14 lbs., Grilse, 6 lbs.	Waterville.
Salmon 11 lbs., Grilse 6 lbs.	No. Salmon 11 lbs., Grilse, 5½ lbs.	Kiltarney.
No. Salmon 16½ lbs., Grilse 5½ lbs.	Yes. Salmon 15 to 20 lbs., Grilse 4 to 8 lbs.	Limerick.
No. Salmon 13½ lbs., Grilse 6½ lbs.	Spring Salmon about the same. Salmon about 14 lbs., Grilse 6 lbs.	Galway.
No. Salmon 10 lbs., Grilse 7 lbs.	No. Salmon 10 lbs., Grilse 7 lbs.	Connemara.
Salmon 12 lbs., Grilse 6½ lbs.	Spring Salmon 11 lbs., Grilse 6 lbs.	Ballinakill.
No. Salmon 10 lbs., Grilse 6 lbs.	Yes. Salmon 8½ lbs., Grilse 4½ lbs.	Dangor.
No. Salmon 10 lbs., Grilse 6 lbs.	No. 10 lbs. to 6 lbs.	Fallins.
Yes. Salmon 9 lbs., Grilse 6 lbs.	Yes. Salmon 9 lbs., Grilse 4 lbs.	Sligo.
No. Salmon 15 lbs., Grilse 6½ lbs.	Salmon 15 lbs., Grilse heavier, 6 lbs.	Ballyshannon.
Yes. Salmon 14 lbs. to 15 lbs., Grilse 3 lbs. to 7 lbs.	Yes; in Spring Salmon.	Letterkenny.
No. Salmon 10 lbs., Grilse 6 lbs.	No. Salmon 10 lbs., Grilse 6 lbs.	Londonderry.
No. Salmon 11 lbs., Grilse 7 lbs.	No. Salmon 12 lbs., Grilse 6 lbs.	Coleraine.
No. Salmon 10 lbs., to 20 lbs., Grilse 3 lbs. to 7 lbs.	Yes. Salmon 10 to 12 lbs., Grilse 3 to 6½ lbs.	Ballycastle.
No. Salmon 14 lbs., Grilse 6 lbs.	No. Salmon 14 lbs., Grilse 3 lbs.	Dundalk.
Cannot ascertain.	Salmon 14 lbs., Grilse 6 lbs.	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

DISTRICT.	Has any sign of disease been observed amongst the Salmon during the year? If so, describe it, and state if it has prevailed to any extent, and where?									
	1903.					1904.				
Dublin, . . .	No,					No,				
Wexford, . . .	No,					No,				
Waterford, . . .	No,					Yes; at Carlow during spawning season, .				
Limerick, . . .	No,					No,				
Cork,	No,					No,				
Cork (Bandon), . . .	No,					No,				
Skibbereen, . . .	No,					No,				
Bantry,	No,					No,				
Kenmare,	No,					No,				
Waterville, . . .	No,					No,				
Killarney,	No,					No,				
Limerick,	No,					No,				
Galway,	Practically none,					No,				
Cornamara,	No,					No,				
Ballinakill,	No,					No,				
Bangor,	No,					No,				
Ballina,	No,					No,				
Sligo,	No,					No,				
Ballyshannon,	No,					No,				
Letterkenny,	No,					No,				
Londonderry,	No,					No,				
Coleraine,	No,					No,				
Ballycastle,	No,					No,				
Dundalk,	No,					No,				
Drogheda,	No,					No,				

of CONSERVATORS relative to SALMON FISHERIES—continued.

Can you give any information about the run of Salmon and Grilse in each month of the close season?		District.
1903.	1904.	
Cannot be ascertained,	No,	Dublin.
Salmon run from October to December. Grilse earlier.	The principal run of Salmon ascends in November and December. Grilse go up earlier.	Wexford.
Depends on the condition of the water. Under favourable circumstances the great run of spawners occurs from middle of October to early in December.	With suitable freshes the principal run of spawners is from latter end of October to end of November and first part of December.	Waterford.
In October and November a large run of Salmon and Peale took place. The number of spawning fish on the beds is much above the average.	A very large run of Salmon took place in October. The fish appeared to be much smaller than usual. The run continued to end of November.	Lisamore.
During October a fair number of fish passed to the upper waters.	No Grilse run in the close season; large quantity of breeding fish run in November and December.	Cork.
No,	Salmon run from October to December; Grilse do not run in any great numbers.	Cork (Bandon).
No,	No,	Skibbereen.
No,	No,	Bantry.
No,	No,	Kenmare.
Fairly good runs of Salmon take place in the months of January and December.	The run of Spring Salmon does not commence till middle or end of December.	Waterville.
In the months of August, September, and October the run of Salmon was rather slight, but there was the largest run of Grilse observed for the past ten years. Largely dependent on the weather.	Run of Salmon and Grilse was had in August, September, and October.	Killarney.
Practically no run during the Close Season until the Spring fish begin to run early in the year.	Cannot answer question satisfactorily.	Limerick.
No,	No run until January,	Galway.
No,	No,	Cannemara.
No information,	No,	Ballinakill.
No,	No,	Bangor.
No,	No,	Ballina.
There was a good run during November and December.	Salmon and Grilse often run in Sligo River in August and September, and a good number in October, November, and December.	Sligo.
Cannot give information,	A late run of Salmon took place during close season.	Ballyshannon.
No,	No,	Letterkenney.
Greatest runs are in October and November.	Largest run in October, and November, but much depends on state of rivers.	Londonderry.
A good run of Salmon during October and November.	No,	Coleraine.
No reliable information,	No,	Ballycastle.
A large run of Salmon in the month of October.	A great run noticed in November and December; was larger than in former years.	Dundalk.
No,	No,	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

District.	Have there been any cases of poisoning the rivers in the District? If so, give particulars of the different cases, and if by Lime, Spurge, or Flax Water.	
	1903.	1904.
Dublin.	One case in River Liffey at Islandbridge.	One case in Liffey at Island Bridge.
Wexford.	No.	No.
Waterford.	No.	No.
Limerick.	No.	Yes. One attempt at Kingwilliamstown.
Cork.	One case of poisoning by spurge.	No.
Cork (Bandon).	One case of poisoning by flax water.	No.
Skibbereen.	No.	No.
Bantry.	One case of poisoning by spurge in the Ballylickey River.	No.
Kenmare.	Two cases of poisoning by spurge in tributaries of the Roughty River.	Slabeny River, tributary to River Roughty, poisoned once by spurge.
Waterville.	No.	No.
Killarney.	One case of poisoning by lime on the Brown Flesk.	Brown Flesk poisoned by lime on one occasion.
Limerick.	No.	Some poisoning took place in Feale and Cashen, but unable to get evidence to secure conviction.
Galway.	No.	No.
Connemara.	No.	No.
Ballinakill.	No.	No.
Bangor.	No.	No.
Ballina.	No.	No.
Sligo.	No.	No.
Ballyshannon.	None, except by flax water.	Two cases by flax water; one by lime.
Letterkenny.	A few cases of flax water poisoning.	Three cases of poisoning by flax water.
Londonderry.	One serious case of malicious poisoning by chloride of lime at Carrickmore. There were also many cases of flax water poisoning.	No serious case except by flax water.
Coleraine.	Yes. Twenty-seven cases of flax water pollution, and four of pollution by effluent from factories.	Eight cases of pollution by milk, and about 20 cases of flax water pollution.
Ballycastle.	A few cases of flax water poisoning.	Almost disappeared. No prosecutions for flax water.
Dundalk.	No.	A few cases of flax water pollution.
Drogheda.	—	No.

of CONSERVATORS relative to SALMON FISHERIES—*continued*.

Has the quantity of Breeding Fish observed in the rivers in your District during this winter been greater or less as compared with last winter?		District.
1903.	1904.	
About the same,	Less,	Dublin.
Greater,	Less,	Wexford.
Much greater. Greatest for past twenty years.	Greater,	Waterford.
Greater,	Greater,	Lismore.
About the same,	About the same,	Cork.
Greater,	Slightly less,	Cork (Bandon)
Much greater,	Less,	Skibbereen
Greater,	Less,	Bantry.
Greater,	Greater,	Kenmare.
Much greater,	Slightly greater,	Waterville.
Greater,	Much less,	Killarney.
Greater,	No change noticed,	Limerick.
Greater,	Less,	Galway.
Greater,	Greater,	Connemara.
About the same,	About the same,	Ballinakill.
Greater,	Greater,	Bangor.
There was a good number of breeding fish but cannot make comparison with last year owing to high floods.	Greater,	Ballina.
Much greater,	Much greater in Masorhamilton Division; less in Ballisodara.	Sligo.
Slightly greater,	Greater in some rivers,	Ballyshannon
Greater,	Greater,	Letterkenny.
Greater,	Greater,	Londonderry.
Much less,	Much greater,	Coleraine.
Greater,	Greater,	Ballycastle.
Greater,	Greater,	Dundalk.
Greater,	No replies received,	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

District.	In what rivers has the quantity increased ?	
	1903.	1904.
Dublin, . . .	Liffey and Bray,	Liffey,
Wexford, . . .	In all rivers in the District,	Slaney, Boco, Urrin, and Bann,
Waterford, . . .	In all tributaries, Freshford Brook (Nore), Fishoge, Barren, Live, Greese, and Douglas (Barrow).	Suir and Barrow. The Nore was as well stocked as last year.
Lismore, . . .	Blackwater and tributaries,	In all tributaries and main river,
Cork, . . .	In Lee for the past few years,	None,
Cork (Bandon), . . .	In all the rivers in District,	None,
Skibbereen, . . .	Ilen,	None,
Bantry, . . .	In all rivers in the District,	None,
Kenmare, . . .	In all rivers in the District,	In all rivers in the district,
Waterville, . . .	In all rivers in the District,	In all rivers,
Killarney, . . .	In all rivers in the District,	None,
Limerick, . . .	In all rivers in the District (with two or three exceptions: especially in the rivers about Nenagh.	No increase in any river,
Galway, . . .	In all rivers in the District,	None,
Connemara, . . .	In Gowla, Ballinabinch, Inver, Screeb, and Costello.	Gowla, Ballinabinch, Inver, Screeb, Cos- tello, and Skannave.
Ballinakill, . . .	In none,	None,
Bangor, . . .	Owenmore and tributaries,	In all rivers,
Ballina, . . .	Cannot say,	In the main rivers and middle portions of the tributaries.
Sligo, . . .	In all rivers in the District,	Bonnett and tributaries,
Ballyshannon, . . .	Erne,	Erne and Bundkewes,
Letteckenny, . . .	Lennan, Crane, Owenca, and Gweedore,	Lennan and Swilly,
Londonderry, . . .	In all rivers in the District,	In all,
Coleraine, . . .	—	Maine, Blackwater, Ballinderry, Clady, and Moyola.
Ballycastle, . . .	In all rivers in the District,	In all Salmon rivers,
Dundalk, . . .	In all rivers in the District,	Glyde and Dee,
Droghada, . . .	In all rivers in the District,	No replies received,

of CONSERVATORS relative to SALMON FISHERIES—continued.

In what rivers has the quantity decreased ?		District.
1903.	1904.	
Vary,	Bray,	Dublin.
—	Derry, and small tributaries of Slaney, .	Wexford.
Slight decrease in the Rathernann and Mounreen tributaries of Barrow, .	In the lowest tributaries, owing to absence of floods, .	Waterford.
—	None,	Lismore.
A decrease in Blarney River has been observed for past two years, .	None,	Cork.
—	Bandon and Argideen,	Cork (Bandon).
—	Ilen,	Skibbereen.
—	In all rivers in the District,	Bantry.
—	None,	Kenmare.
—	None,	Waterville.
—	Lane, Fiesk, Maize, and tributaries, .	Killarney.
Kelley River near Killaloe, and Shannon at Castleconnell, .	No decrease in any river,	Limerick.
—	Rather less in all rivers,	Galway.
Dochulla and Skannive,	Dochulla,	Connemara.
None,	None,	Ballinakill.
A slight decrease in those flowing into Carrownore Lake, .	None,	Bangor.
Cannot say,	None,	Ballina.
—	Bellinodare and tributaries,	Sligo.
No decrease reported,	Eske and lower,	Ballyshannon.
No decrease reported,	None,	Letterkenney.
—	None,	Londonderry.
In all rivers in the District,	None,	Coleraine.
—	None,	Ballycastle.
—	No decrease noticed,	Dundalk.
—	No replies received,	Drogheda.

SUBSTANCE OF REPORTS received from CLERKS

District.	Was the state of the rivers favourable or unfavourable to spawning, and to the protection of spawning, and spent fish, and young fry?			
	1903.		1904.	
Dublin, . . .	Favourable in Liffey and Bray. . .		Liffey very favourable. . .	
Wexford, . . .	Favourable, . . .		Favourable in all rivers, . . .	
Waterford, . . .	Most favourable, . . .		Unfavourable in tributaries owing to absence of floods preventing the fish getting up.	
Lismore, . . .	Favourable, . . .		Favourable, . . .	
Cork, . . .	Favourable, . . .		Favourable, . . .	
Cork (Bandon), . . .	Favourable in all rivers. Very favourable at Hen.		Favourable in Bandon and Argideen, . . .	
Skibbereen, . . .	Favourable, . . .		Very favourable, . . .	
Bantry, . . .	Favourable, . . .		Favourable, . . .	
Kennmare, . . .	Favourable, . . .		Favourable, . . .	
Waterville, . . .	—		Favourable, . . .	
Kilgarney, . . .	—		Unfavourable in the smaller rivers owing to dry weather.	
Limerick, . . .	Most favourable, . . .		Favourable, . . .	
Galway, . . .	Favourable, . . .		Favourable for spawning. Favourable for descent of spent fish.	
Connemara, . . .	Favourable, . . .		Favourable, . . .	
Ballinakill, . . .	Favourable, . . .		Favourable in all rivers, . . .	
Bangor, . . .	Favourable, . . .		Most favourable, . . .	
Ballina, . . .	Unfavourable owing to high floods, . . .		Very unfavourable for three weeks in December.	
Sligo, . . .	Very favourable, . . .		Favourable for Bonet, Ballinacore, and Ballinacarrow.	
Ballyshannon, . . .	Most favourable, . . .		Favourable, . . .	
Lettinkenny, . . .	Very favourable in Lennan, Crana, Owenca, and Gweedore.		Favourable owing to high water, . . .	
Londonderry, . . .	Favourable, . . .		Very favourable, . . .	
Coleraine, . . .	Favourable in all except the Kells River. . .		Favourable, . . .	
Ballycastle, . . .	Very favourable in Rush. Favourable in Glenesh, Margy, and Glenarm.		Favourable, . . .	
Dundalk, . . .	Favourable, . . .		Favourable owing to continued floods. The run of fish on the Fane was later than in other rivers.	
Drogheda, . . .	Favourable, . . .		No sepias received, . . .	

of CONSERVATORS relative to SALMON FISHERIES--*continued.*

Any particular observations?		DISTRICT.
1903.	1904.	
—	—	Dublin
—	—	Wexford.
—	—	Waterford.
—	—	Limer.
During the months of March and April, 1904, a very large number of fry passed to the sea.	Remarkable increase of large cod fish on the spawning beds.	Cork.
—	—	Cork (Bandon).
The great increase in the number of spawning fish is due to the fry put into the river by the Board of Conservators.	—	Skibbereen.
Greater number of spawning fish observed than for the past ten or twelve years.	—	Bantry.
—	—	Kenmare.
—	—	Waterville.
—	—	Killarney.
—	—	Limerick.
A number of men were employed to pick up and clean the gravel in the inland rivers which had become hard and overgrown with weeds.	—	Galway.
This proved a great success, every place so treated was during the season fully utilized by breeding fish.	—	Connemara.
—	—	Ballinakill.
—	—	Bangor.
—	Very mild weather during spawning season. Winter very favourable. All conditions good.	Ballina.
Board's funds insufficient to improve spawning beds.	Damage caused by carelessness of mill owners and poaching along sea coast.	Sligo.
—	—	Ballyshannon.
—	—	Letteckenny.
—	—	Londonderry.
Spawning salmon were much larger and spawned earlier in the year.	Spawning Salmon are larger than usual, and more plentiful than for last fifteen years.	Coleraine.
—	—	Ballycastle.
—	—	Dundalk.
—	—	Down.

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NOTE.—The references expressed in Roman numerals are to the separate numbers of "Scientific Investigations, 1904," to which the divisions of this appendix correspond. The Arabic numerals which follow refer to the pagination of each number.

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DUBLIN CASTLE,

19th December, 1906.

SIR,

I have to acknowledge the receipt of your letter of the 18th instant forwarding, for submission to His Excellency the Lord Lieutenant, the Report of the Sea and Inland Fisheries of Ireland for the year 1904, Part II., Scientific Investigations.

I am,

Sir,

Your obedient servant,

J. B. DOUGHERTY.

THE SECRETARY,

DEPARTMENT OF AGRICULTURE

AND TECHNICAL INSTRUCTION,

UPPER MERRION-STREET, DUBLIN.

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